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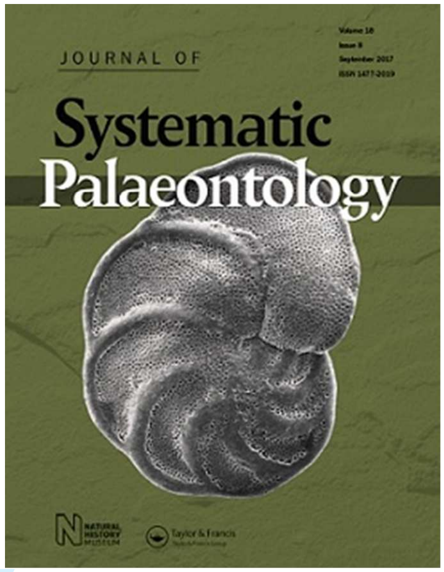

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A new metriorhynchid crocodylomorph from the Oxford Clay Formation (Middle Jurassic) of England, with implications for the origin and diversification of Geosaurini

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Metriorhynchids are an extinct group of Jurassic-Cretaceous crocodylomorphs secondarily adapted to a marine lifestyle. A new metriorhynchid crocodylomorph from the Oxford Clay Formation (Callovian, Middle Jurassic) of England is described. The specimen is a large, fragmentary skull and associated single ramus of a lower jaw uniquely preserved in a septarian concretion. The description of the specimen reveals a series of autapomorphies (apicobasal flutings on the middle labial surface of the tooth crowns, greatly enlarged basoccipital tuberosities) and a unique combination of characters that warrant the creation of a new genus and species: *Ieldraan melkshamensis* gen. et sp. nov. This taxon shares numerous characters with the Late Jurassic–Early Cretaceous genus *Geosaurus*: tooth crowns that have three apicobasal facets on their labial surface, subtly ornamented skull and lower jaws elements, and reception pits along the lateral margin of the dentary (maxillary overbite). Our phylogenetic analysis places this new species as the sister taxon to the genus *Geosaurus*. This new taxon adds valuable information on the time of evolution of the macrophagous subclade Geosaurini, which was initially thought to have evolved and radiated during the Late Jurassic. The presence of *Ieldraan melkshamensis*, the phylogenetic re-evaluation of *Suchodus durobrivensis* as a *Plesiosuchus* sister taxon and recently identified Callovian *Dakosaurus*-like specimens in the Oxford Clay Formation, indicate that all major Geosaurini lineages originated earlier than previously supposed. This has major implications for the evolution of macropredation in the group. Specifically, we can now demonstrate that the four different forms of true ziphodonty observed in derived geosaurins independently evolved from a single non-functional microziphodont common ancestor.

Keywords: *Ieldraan* – Melksham monster – *Geosaurus* – Geosaurini – Jurassic – Macrophagy.

Introduction

Metriorhynchids are an extinct clade of pelagic crocodylomorphs that were geographically widespread at low latitudes during the Jurassic and Cretaceous (Eudes-Deslongchamps 1867–1869; Fraas 1902; Andrews 1913; Pol & Gasparini 2009; Young *et al.* 2010; Fernández *et al.* 2011; Herrera *et al.* 2015; Chiarenza *et al.* 2015; Mannion *et al.* 2015; Wilberg 2015; Barrientos-Lara *et al.* 2016). Recent studies have revealed disparate craniomandibular and dental morphologies among these species, which supported a wide spectrum of feeding behaviours, and thus diets (Andrade *et al.* 2010; Young *et al.* 2010, 2011a, 2012a). The typical piscivorous forms are phylogenetically grouped in Metriorhynchinae, whilst the other subfamily, Geosaurinae, evolved clear macropredatory features in the most derived forms, Geosaurini (*sensu* Cau & Fanti, 2011) (Pol & Gasparini 2009; Andrade *et al.* 2010; Young *et al.* 2011a, 2011b, 2012b).

Recent revisions on the taxonomy of Oxford Clay Formation (OCF) metriorhynchids suggest that the evolution of macropredatory adaptations within Geosaurinae may be more complex than previously thought, and these features may have developed particularly early in metriorhynchid evolution (Young *et al.* 2013a). In particular, craniomandibular and dental morphologies described in *Tyrannoneustes lythrodectikos*, *Dakosaurus*-like specimens (the 'Mr Leeds Dakosaur' OTU in the phylogenetic analysis of Young *et al.* 2016) from England and Northern France, and the phylogenetic reassessment of *Suchodus durobrivensis* showed that major macrophagous adaptations had already evolved by the late Middle Jurassic (Lepage *et al.* 2008; Young *et al.* 2013a; Foffa & Young 2014; Young *et al.* 2016). The only major exception appears to be the unique occluding mechanism of the Late Jurassic-Cretaceous genus *Geosaurus* (Young & Andrade 2009; Andrade *et al.* 2010), which seems to have been a later development.

Within this context, we describe a new genus of OCF metriorhynchid based on a large individual, NHMUK PV OR 46797. The new taxon shows striking morphological similarities with the genus *Geosaurus.* However, the differences are enough to establish a new taxon, *Ieldraan melkshamensis* gen. et sp. nov., based on autapomorphies and a unique combination of characters. Our phylogenetic analysis supports *Ieldraan melkshamensis* as the sister taxon to *Geosaurus*. The presence of *Ieldraan melkshamensis* in the OCF pushes the origins of the *Geosaurus* subclade (here formally defined as Geosaurina subtr. nov.) back to, at least, the late-Middle Jurassic. The unique dental morphology of this new taxon demonstrates that the evolution of ziphodonty in Geosaurini is more complex than previously hypothesised, as it seems to have independently evolved three or four times in Metriorhynchidae. Finally, the occurrence of a geosaurin-like taxon in the OCF demonstrates that all major Geosaurini clades were already present (even though their occurrence was much rarer) before achieving the large diversity recorded in the Late Jurassic European Formations.

Historical Information

The specimen NHMUK PV OR 46797 was purchased in 1875 by the British Museum (Natural History), and it now resides in the NHMUK, as part of the Cunnington Collection. The specimen has only been mentioned once in the literature, by Lydekker (1889), who described the specimen as: *"Mass of matrix containing portions of the cranium and mandible; from the Oxford Clay of Melksham, Wiltshire. The occipital condyle, part of the premaxilla with teeth, as well as a large portion of the left ramus of the mandible with teeth are well preserved; the enamel of the teeth is fluted."*, and referred it to *Metriorhynchus moreli* (a subjective junior synonym of *Metriorhynchus superciliosus*). In 2013, one of us (MRG) undertook painstaking mechanical preparation that exposed new details of the skull, lower jaw and teeth that were previously hidden within the matrix. The specimen is extensively damaged and crossed by several veins of calcite. The radial pattern of the veins is typical of septarian nodules, a particular kind of concretion (Sellés-Martínez 1996; Hendry *et al.* 2006). These nodules are the result of physical and chemical processes (perhaps caused by bacterial activity) during marine mudrock diagenesis (Hendry *et al.* 2006). Specifically, the expansion of boulders caused by the circulation of inner fluids, the deposition of minerals, or by the contraction of boulders caused by chemical extraction of fluids (Sellés-Martínez 1996; Hendry *et al.* 2006). Regardless of their formation mechanism, the diagenetic processes caused major physical damage to the dorsal and lateral sides of the skull.

Institutional Abbreviations

BRSMG, Bristol Museum & Art Gallery, Bristol, England, United Kingdom; **BSPG,** Bayerische Staatssammlung für Paläontologie und Geologie, München, Germany; **CAMSM,** Sedgwick Museum, Cambridge, England, United Kingdom; **DORCM,** Dorset County Museum, Dorchester, England, United Kingdom; **GLAHM,** Hunterian Museum, Glasgow, Scotland, United Kingdom; **NHMUK**, Natural History Museum, London, England, United Kingdom; **MJML**, Museum of Jurassic Marine Life – the Steve Etches Collection, Kimmeridge, England, United Kingdom; **MOZ**, Museo Profesor J. Olsacher, Zapala, Argentina; **MPV**, Musée Paléontologique de Villers-sur-Mer, France; **MNHN**, Muséum National d'Histoire Naturelle, Paris, France; **OUMNH,** Oxford University Museum of Natural History, Oxford, England, United Kingdom; **PETMG**, Peterborough Museum & Art Gallery, Peterborough, England, United Kingdom; **SMNS,** Staatliches Museum für Naturkunde, Stuttgart, Germany.

Anatomical Abbreviations

an, angular; **boc**, basioccipital; **bt**; basioccipital tuberosity; **cp,** coronoid process; **D**, dentary tooth or alveolus; **den**, dentary; **exo,** exoccipital; **fm,** foramen magnum; **fr**, frontal; **j**, jugal; **lsph,** laterosphenoid; **M**, maxillary tooth or alveolus; **mc,** meatal chamber; **mx**, maxilla; **nas**, nasal; **nf**, nutrient foramen; **oc**, occipital condyle; **orb,** orbit; **P**, premaxillary tooth or alveolus; **par,** parietal; **pmx**, premaxilla; **po**, post-orbital; **pop**, paroccipital process of the opisthotic; **prf**, possible prefrontal fragment; **pro,** proötic; **qj,** quatratojugal; **qu**, quadrate; **rp**, reception pit; **san**, surangular; **san-den gr,** surangulodentary groove; **so,** supraoccipital; **spl,** splenial; **sq**, squamosal; **stf**, supra-temporal fenestra; **tc**, tooth.

Abbreviations for teeth and alveoli are followed by numbers referring to their relative order, for example M1 would be the anterior-most maxillary tooth or alveolus.

Systematic palaeontology

In this section we describe the holotype of a new metriorhynchid crocodylomorphs from the Middle Jurassic of England.

Superorder **Crocodylomorpha** Hay, 1930 (*sensu* Walker, 1970)

Suborder **Thalattosuchia** Fraas, 1901 (*sensu* Young & Andrade, 2009)

Family **Metriorhynchidae** Fitzinger, 1843 (*sensu* Young & Andrade, 2009)

Subfamily **Geosaurinae** Lydekker, 1889 (*sensu* Young & Andrade, 2009)

Tribe **Geosaurini** Lydekker, 1889 (*sensu* Cau & Fanti, 2011)

Subtribe **Geosaurina** subtr. nov.

Type Genus. *Geosaurus* Cuvier, 1824 (*sensu* Young *et al.* 2012a)

Geological Range. middle Callovian to Valanginian [~34 Ma]

Geographical Range. European endemic (United Kingdom, Germany, and France)

Diagnosis. Metriorhynchid crocodylomorphs with the following unique combination of characters (autapomorphic characters are indicated by an asterisk*): inconspicuously ornamented maxillae; teeth with three apicobasal facets on the labial surfaces*; laminar (strongly mediolaterally compressed) teeth dominate the dentition*; maxillary tooth row overbites the dentary tooth row*.

Genus ***Ieldraan***, gen. nov.

(Figs 1–4)

ZooBank Life Science Identifier (LSID) for genus:

urn:lsid:zoobank.org:act: [To be added upon acceptance]

Type Species. *Ieldraan melkshamensis* gen. et sp. nov., by monotypy.

Diagnosis. Same as for the only known species (monogeneric).

Derivation of the name. 'Older One'. *Ieldra*, Old English for older; and *an*, Old English for one, referring to the stratigraphically older age of this new genus compared to its close relative *Geosaurus.*

Species ***Ieldraan melkshamensis,*** sp. nov.

(Figs 1–4)

1888 *Metriorhynchus moreli* Eudes-Deslongchamps – Lydekker:. 97

ZooBank Life Science Identifier (LSID) for species:

urn:lsid:zoobank.org:act: [To be added upon acceptance]

Type specimen. The specimen NHMUK PV OR 46797 is an incomplete and severely diagenetically damaged skull (including fragments of maxilla, portions of the nasals, frontal, both prefrontals, postorbitals, left squamosal, basioccipital, occipital condyle, exoccipital-opisthotic, quadratojugal) and left mandibular ramus (incomplete dentary, splenial, angular and surangular). The skull is dorsolaterally flattened with several disarticulated skull roof and rostral elements. The left mandible is preserved and exposed in lateral view. The right mandible one is either lost or still embedded in the matrix. Several teeth, some of which are complete, are preserved in life-position on both skull and lower jaws.

Diagnosis. Metriorhynchid crocodylomorph with the following unique combination of characters (autapomorphic characters are indicated by an asterisk*): apicobasal parallel flutings on the middle facet of the labial surface*; enlarged tooth crowns; denticulated keeled carinae with microscopic, poorly developed, non-contiguous, non-uniform in size and shape denticles; ornamentation of skull and mandible elements consisting of small pits and shallow fine grooves (shared with *Geosaurus*); greatly enlarged basioccipital tuberosities*.

Additionally, the hypoglossal nerve opening is situated below the level of the ventral rim of the foramen magnum*.This could also be a diagnostic feature, but without CT-scans from a well preserved specimen it is difficult to be sure of the correct location of the hypoglossal nerve opening (see Description).

Derivation of the name. ‘Older One from Melksham’, epithet translated from Latin, locative case.

Remarks. Unfortunately, there is no postcranial material associated with the specimen, so we can only rely on the incomplete basicranial length for estimating total body length. Based on the better preserved mandibular ramus we estimated a range of potential basicranial length of approximately 55–60 cm for NHMUK PV OR 46797, which using the Young *et al.* (2011b) body length equations, corresponds to a total body length of 2.95–3.22 m. This is comparable to the largest known *Geosaurus* specimen – a skull referred to *G. giganteus*, NHMUK PV OR 37020 – of approximately 3 m in total body length. However, considering the distortion that the specimen has undergone, we recommend caution using these estimates in quantitative analyses.

Description

Cranium. NHMUK PV OR 46797 is an incomplete and severely damaged skull and associated left mandibular ramus. The skull is flattened and exposed in dorsal/left lateral view and was diagenetically broken in several fragments, and it is locally reduced to shards (Figs 1–3). The left mandible is also exposed in lateral view, and misses the anterior dentary and the articular area. The maxillae, frontal, both prefrontals, large parts of both postorbitals, the left squamosal, the parietal and various broken bones on the occipital complex can be confidently identified. The premaxilla and the anterior part of the nasals have been lost during diagenesis, unlike the orbital area, which is recognisable in dorsal view (Figs 1, 3). Similarly, the deformed boundary of the left supratemporal area can be followed in dorsal view (Figs 1, 3G, K). Close examination of the specimen revealed that the intertemporal bar must have collapsed on its right side. Subsequent diagenesis must have obliterated most of this area, leaving only the posterior medial side of the left supratemporal fenestra intact (Fig. 3C). The occipital surface (Figs 2–3E) emerges from one side of the block, where the paroccipital process of the opisthotic, the occipital condyle, the basioccipital tuberosities and parts of the quadrates are accessible. Approximately ten teeth are preserved, but only three or four are complete enough to be described. They are still in life position in the left maxilla and dentary.

Numerous other fragments have been exposed during mechanical preparation. They include the posterior part of both nasals and the left jugal (and perhaps quadratojugal), and can be identified by their anatomical association with other elements (Figs 1, 3). The rest of the skull, including premaxillae, the left-ventral side of the rostrum, the orbital and post-orbital areas, the braincase, most of the parietal-squamosal, the quadrates and the entire palate surface, are inaccessible, too fragmented or too crushed to be described

Despite the fragmentary preservation, the external bone texture of all the major fragments is well preserved. Shallow grooves and small, densely packed pits ornament the surface of the largest skull and mandible fragments (Figs 1, 3A, B, D). This same pattern is consistently found on the external surface of the maxilla, frontal, ?nasals, dentary, angular, surangular and splenial. It is remarkably similar to the pattern described in *Geosaurus* species (Young & Andrade 2009; Young *et al.* 2013a). In contrast, it radically differs from the dermatocranium ornamentation of any other metriorhynchids, especially the Callovian species. Metriorhynchid skulls are either conspicuously and heavily ornamented, as in *Metriorhynchus superciliosus, Maledictosuchus riclaensis,* '*Metriorhynchus*' *brachyrhynchus* (NHMUK PV R 2168; NHMUK PV R 3699; NHMUK PV R 3700; NHMUK PV R 3804), *Tyrannoneustes lythrodectikos* (NHMUK PV R 3939; PETMG R176), *Suchodus durobrivensis* (NHMUK PV R 2039), and the best preserved *Dakosaurus*-like specimens (NHMUK PV R 3321); or almost entirely smooth, as in *Cricosaurus lithographicus,* *Dakosaurus andiniensis* (MOZ 6146P), *Plesiosuchus manselii* (NHMUK PV OR 40103), *Torvoneustes carpenteri* (BRSMG Cd7203) and *T. coryphaeus* (MJML K1863) (Andrews 1913; Pol & Gasparini 2009; Young & Andrade 2009; Young *et al.* 2012b, 2013a; Table 1 in Young *et al.* 2013a; Herrera *et al.* 2013; Parrilla-Bel *et al.* 2013; Foffa & Young 2014). Several contacts and other superficial features were obliterated by the mechanisms which led to the formation of septarian nodule.

Neither maxilla is entirely preserved. Two large pieces of the right maxilla are exposed in lateral view and are the best source of morphological information for this element (Figs 1, 3D). It is not clear if either premaxilla is even partially preserved (contra Lydekker 1889) and the contact between the two elements – if it is present – is obscured by the poor preservation of the specimen in the area. Anteriorly, the lateral surface of the left maxilla is sufficiently well preserved to show some distinctive features including reception pits for dentary teeth, nutrient foramina and distinctive bone ornamentation (Fig. 3D).

The above mentioned reception pits are seen in other metriorhynchids and are thought to be linked with tooth interlocking in macrophagous taxa (Young & Andrade 2009; Young *et al.* 2012a, 2012b, 2013b, Foffa & Young 2014). In *Geosaurus giganteus* (NHMUK PV OR 37020) the D4 tooth is greatly enlarged in respect to the adjacent teeth, and it is hosted in a long notch between the P3 and M1 alveoli (Young & Andrade 2009). Unfortunately, neither the size of the D4 tooth nor the presence of an enlarged reception pit can be assessed with certainty in NHMUK PV OR 46797 due to the poor preservation, but if they were observed in future, more complete specimens, it would be a feature shared with *Geosaurus giganteus* (NHMUK PV OR 37020).

In metriorhynchids (and thalattosuchians generally) the nasals are broad, slightly curved elements with a triangular shape in dorsal view (Andrews 1913). In NHMUK PV OR 46797 they are recognisable by their association with the fragments of the right maxilla and anterior extent of both prefrontals (Figs. 1, 3A, H, K). Their ornamentation does not substantially differ from the other skull elements. Unfortunately, they cannot be described further due to poor preservation (Figs 1, 3A), as this area is crossed by major calcite veins that have reduced the majority of the medial frontal anterior process, nasals and maxillae into shards.

The prefrontals are exposed in dorsal view and are laterally well developed – an apomorphy of Metriorhynchidae (Andrews 1913). They are preserved in association with the frontal and their posterolateral crenulated edge is also still visible overhanging the anterior part of the orbits (Figs 1, 3A–B). The right prefrontal is preserved in three or four pieces and its original shape is nearly impossible to assess (Fig. 3A–B). The posterior end of the prefrontal-frontal-nasal suture is preserved and visible, and in our interpretation, the line along which the right prefrontal detached from the rest of the skull could be the medial margin of this very suture. The left prefrontal was only exposed recently by mechanical preparation. Similar to its right counterpart, the left prefrontal is also detached from the main body of the frontal, along what looks like their sutural contact. Compared to the right prefrontal, its lateral and posterior margins are better preserved and, despite a large crack crossing it, the typical teardrop-shape in dorsal view – another apomorphy of Metriorhynchidae (Young & Andrade 2009; Young *et al.* 2016) – is still recognisable (Figs 1, 3A).

The prefrontal is longer than wide – a typical condition of most metriorhynchids – and its lateral side describes a continuous convex curve with an inflexion forming a nearly 70 degree angle with the anterior-posterior axis of the skull. The value of the latter angle varies in metriorhynchids and has diagnostic importance, being small in *Dakosaurus* (approximately 50 degrees), larger in most other geosaurines (approximately 60-70 degrees) and larger (up to 90 degrees) in metriorhynchines (Wilkinson *et al.* 2008, Young *et al.* 2013b, 2016).

The ornamentation pattern is inconspicuous and very similar to *Geosaurus* species in being dominated by small (~0.5-2 mm in diameter) and densely distributed ornamental pits and shallow grooves. The latter are deeper along the lateral and posterior margin of the prefrontal than elsewhere on the skull and lower jaws (Young *et al.* 2013a).

In metriorhynchids, the anterodorsal margin of the orbit is over-hanged by the laterally expanded prefrontal, while the dorsal margin is constituted by the orbital notch, which is the narrowest point of the frontal (interorbital distance) on the skull roof (Andrews 1913). The orbital notch is formed by the lateral margins of the prefrontal–frontal and the anterior part of the postorbital bar, and can be seen in NHMUK PV OR 46797 (Figs 1, 3A–B). This allows us to recognize the location of both orbits – but not to accurately measure their dimensions.

The frontal is easily recognised among the skull elements, even though it is severely damaged. It is a large, flat bone that extends from the posterior end of the snout to the middle margin of the supratemporal fossa, and it bears no sign of an interfrontal suture (Figs 1, 3A, H, K). All the processes of the frontal are damaged but preserved, with the exception of the anterior process that is completely destroyed along the anterior nasal-frontal suture (Figs 1, 3A). The medial-posterior process is broken anterior to the frontal-parietal contact, while the left posterior-lateral process is still articulated with the postorbital (though the suture is unidentifiable) (Figs 1, 3A). In metriorhynchids the frontal participates in the dorsal margin of the orbit. This is visible on both sides but better preserved on the right side.

Posteriorly, the anteromedial margin of the left supratemporal fossa is intact. The angle between the lateral and medial posterior processes is ~60-70 degrees, within the range of geosaurines, with the exception of *Dakosaurus andiniensis* (~45-50 degrees – convergent with *Cricosaurus*) (Wilkinson *et al.* 2008; Pol & Gasparini 2009; Cau & Fanti 2011; Young *et al.* 2012b, 2013a; Cau 2013; Herrera *et al.* 2013; Foffa & Young 2014), and narrower than in *Metriorhynchus superciliosus,‘Metriorhynchus’ casamiquelai, ‘Metriorhynchus’ westermanni*, and basal metriorhynchoids such as *Pelagosaurus typus, Eoneustes* species, and *Zoneait nagorum* (~90 degrees or obtuse angle) (Wilberg 2015).

The frontal ornamentation of *Ieldraan melkshamensis* is unique among Callovian geosaurines in being less conspicuous than other contemporaneous members of the subfamily (Fig. 3A) (Young & Andrade 2009; Table 1 in Young *et al.* 2013b). The orientation of pits and grooves follows the typical radial pattern observed in all metriorhynchids (Fig. 1) (Andrews 1913; Young & Andrade 2009, Young *et al.* 2013a, b). Interestingly, *Gracilineustes leedsi* is the only other metriorhynchid in the OCF that has a similarly smooth cranial ornamentation (NHMUK PV R3015, CAMSM J.64297, GLAHM V1009; PETMG R24; PETMG R72) (Andrews 1913). *Ieldraan melkshamensis* is the oldest Geosaurini with this type of dermal ornamentation pattern. This becomes very common in the Late Jurassic geosaurins *Torvoneustes, Geosaurus, Dakosaurus*, and replaces the heavily pitted and deeply grooved pattern of pre-Oxfordian metriorhynchids (Wilkinson *et al.* 2008; Pol & Gasparini 2009; Young & Andrade 2009; Young *et al.* 2012b; Table 1 in Young *et al.* 2013b).

Posterior to the orbit, both postorbital are preserved, although severely damaged (Figs 1, 3A, G). The right temporal bar is missing large sections posterior to the postorbital-squamosal contact (Figs 1–3). Conversely, the left upper temporal bar is well exposed in lateral view for most of its length (from the frontal to the upper and posterior borders of the meatal chamber) (Fig. 3G) (see Montefeltro *et al.* 2016 for an account of the meatal chamber morphology in Thalattosuchia). The left squamosal and parts of the quadrate (and perhaps the quadratojugal) also sit in life position in dorsolateral view. The exact location of the postorbital-squamosal suture is not visible on either side. An additional section of the squamosal is visible in occipital view, sitting on top of the paroccipital process of the opisthotic (Figs 2, 3E).

The medial section of the supratemporal fossa is poorly preserved. As previously stated, the parietal-frontal contact is missing, as it is the largest part of the medial wall. This is normally composed by the frontal (anteriorly), parietal (posteriorly), and proötic and laterosphenoid (ventrally). In NHMUK PV OR 46797, this area is severely damaged by calcite veins, which made further preparation too precarious. However, some fragments emerge in between the calcite veins and the matrix. These are the anteromedial corner of the left fenestra (see frontal section) (Fig. 3A), the left side of the medial processes of the parietal, the proötic, and the quadrate (and a partially covered fragment of the laterosphenoid) (Fig. 3C). The lateral exposure of the left parietal, ?proötic and potentially laterosphenoid suggests that the entire parietal bar has collapsed on its right side – an interpretation that is also supported by the rotation of the occipital complex. These elements constitute the posterior and medial corner of the left temporal fossa (Fig. 3C, K). We also report a medium-sized foramen (~4-5 mm in diameter) piercing the parietal/proötics (arrow in Fig. 3C). This likely is a blood vessel foramen such as the post-temporal canal (normally located between the parietal and proötic – and perhaps the quadrate if large – see Jouve, 2009). In '*M.*' cf. *westermanni* the post-temporal foramen is on the suture between the surapoccipital and partietal; however this opening can be open or closed variably within a single species (e.g. *Cricosaurus araucanensis*) (Jouve 2009, Fernández *et al.* 2011). It is also possible that this foramen is a nerve opening for the temporo-orbital canal. Its position and shape are incompatible with the trigeminal (cranial nerve V) foramen, as this opening is usually larger in size, situated in a large fossa hosting the trigeminal ganglion, and pierces the proötic and laterosphenoid, as reported in '*M.*' cf. *westermanni* (Fernández *et al.* 2011) and *Steneosaurus* cf. *gracilirostris* (NHMUK PV OR 33095) (Brusatte *et al.* 2016) (Fig. 3C). Poor preservation precludes access to these areas in NHMUK PV OR 46797.

Occipital surface. The entire occipital complex is largely compromised by breaks and it has been tilted clockwise around the anteroposterior axis of the skull when seen in posterior view (Figs 1–2, 3E). Similar to the rest of the skull, only a few elements of the occipital complex are confidently identifiable, and many are partially or entirely missing (e.g. the quadrates). Unfortunately, the majority of bones are reduced into unidentifiable fragments and scattered in no clear anatomical connection. There are, however, some noticeable exceptions, amongst which are the basioccipital and exoccipital–opisthotics.

The basioccipital is well preserved and forms the medial part of the occipital surface ventral to the foramen magnum (Figs 2, 3E). The most striking feature of its main constituents – the occipital condyle and basioccipital tuberosities (= basal tubera) – are their large size. Noticeably, in NHMUK PV OR 46797 the entire complex appears comparatively large to that of most other thalattosuchians, although the exact extent of this is difficult to quantify. In particular, the basioccipital tuberosities are unusually large in NHMUK PV OR 46797. Their posterior surface is mostly smooth, unlike the very rough ventral convexities. The two processes are separated by a wide 'V'-shaped concavity in posterior view. The right tuberosity is better preserved and demonstrates that this structure is larger in *Ieldraan melkshamensis* than in any other metriorhynchid, and most resembles in size the basioccipital tuberosities of *Machimosaurus* spp. and *'Steneosaurus' herberti* (Young *et al.* 2013b; 2014a). This feature is apomorphy of *Ieldraan melkshamensis* amongst Metriorhynchidae but, considering that every known *Geosaurus* specimens lacks preserved basioccipital tuberosities, we cannot discount the possibility that this feature is a shared feature of Geosaurina.

The dorsal and medial sides of the basioccipital are occupied by the occipital condyle. The hemispherical surface of this articulation is not completely smooth, and features a single pit, a characteristic that is also seen in other metriorhynchids (e.g. Mr Leeds' Dakosaur, NHMUK PV R 3321) but not in others (*'Metriorhynchus' brachyrhynchus*, NHMUK PV R 3804). The position and size of the pit appear to vary across the clade, and in NHMUK PV OR 46797 it sits in the dorsal half of the condyle. Further comparison is required to determine if this feature has any phylogenetic significance.

The foramen magnum is positioned above the occipital condyle and only its ventral margin is completely preserved. The basioccipital participates in the ventral rim of the foramen magnum through the dorsal extent of the occipital condyle. However, only a minor part of the rim (~30% of its length) is constituted by the basioccipital. The rest of it is bordered on both sides by the exoccipital–opisthotics.

In occipital view, the contact between the exoccipital-opisthotics passes diagonally through the lateral margin of the basioccipital tuberosities and cuts across to the top corner of the occipital condyle (Figs 2, 3E). The full extent of the exoccipital–opisthotics is not clear, as it is not discernible whether the exoccipital is fused to the opisthotics to form an otoccipital (also see *Torvoneustes coryphaeus*; Young *et al.* 2013a). The surface of the exoccipital–opisthotic complex is normally pierced by numerous cranial nerve and blood vessel foramina. In NHMUK PV OR 46797, only a pair of foramina (here identified as being for the hypoglossal nerves) is visible on both sides of the occipital condyle, ventral to the level of the foramen magnum ventral rim (Fig. 2). This opening is laterally aligned with the occipital condyle, and not dorsomedial to it, as in most metriorhynchids and thalattosuchians (Young *et al.* 2013a). This may be a diagnostic feature of *Ieldraan melkshamensis* among Thalattosuchia. However, although the position of this foramen is congruent with the same feature in other metriorhynchids, unless CT-scans of a complete skull become available, it is difficult to compare with extant crocodylians, which have an osteological correlate for this nerve opening; thus, this can only be a hypothesis for the moment. On the right side, slightly ventrolateral to the hypoglossal opening, a channel for an unknown opening is preserved on both sides at the basioccipital-exoccipital suture (labelled as '?'), but we cannot describe it further due to damage in this area. A pair of foramina, roughly in the same area, is also reported in *Torvoneustes coryphaeus* (identified as '?' Fig. 8 in Young *et al.* 2013a).

A large, flat surface is well exposed on the posterior/lateral sides of the squamosal and it is situated above a well-developed crest that most likely is part of the paroccipital process of the opisthotic (Figs 1–2). Pol & Gasparini (2009) reported that this is a common feature of all thalattosuchians, although size and orientation are variable in Metriorhynchidae.

A broad arch with dorsal concavity is visible in occipital view. It is separated by a fracture from the main occipital surface, and sits in association with the supraoccipital, exoccipital and parietal (Figs 2, 3E). We identify this element as the left squamosal, which in life would have bordered the posterior rim of the supratemporal fenestra, sitting on top of the lateral expansion of the exoccipital.

What may be a large fragment of the supraoccipital is preserved above and slightly dislodged from the occipital condyle below the tilted parietal (Figs 2, 3H, I, K) It is crossed by a vertically-running crack that may represent a mid-line structure similar to the ridge visible in specimens referred to *'Metriorhynchus' brachyrhynchus* (NHMUK PV R 3804). A small fragment of the parietal sits on top of it (well visible in lateral view in Figs 1, 3C). Given its fragmentary preservation, not much can be added to the description of these elements.

Mandible. The lower jaw is the best-preserved part of NHMUK PV OR 46797, probably because the calcite veins of the septarian nodule only partially reached this area (Fig. 3J–K). Only the left ramus is exposed, whilst the right one is probably still embedded in the concretion. Unfortunately, it cannot be easily accessed due to the weight, fragility and size of the specimen, so we have left it unprepared for the time being. Nevertheless, the left ramus is sufficiently informative to describe the lower jaw.

The left ramus of the NHMUK PV OR 46797 is well-exposed on its lateral side, and is only slightly deformed (Fig. 1). The majority of the anterior mandibular symphysis is not present, whilst its posterior section is exposed in ventral view on one side of the concretion. Most of the posterior dentary, the angular, surangular and splenial, and the contacts amongst these bones, can be confidently identified and described. The posterior extent of the angular and surangular also are missing, and so is the retro-articular process. However, the triangular shape of the jaw section in occipital view (Fig. 2) indicates that the break must have occurred somewhere across the articular, posterior to the glenoid fossa (inaccessible because it is embedded in the matrix). The coronoid, articular, prearticular, and the entire medial side of the mandibular ramus are also impossible to access.

The mandible of *Ieldraan melkshamensis* would have been ~60–65 cm long, with a moderately short and robust mandibular symphysis, and a deep posterior half with a prominent coronoid process lower than the level of the glenoid fossa. All of these features are apomorphies of Geosaurini and are linked to increased mechanical resistance, optimum gape angle and ultimately wide-gape macrophagy (Pol & Gasparini 2009; Young & Andrade 2009; Young *et al.* 2012a, 2012b, 2013b).

A well-defined groove is developed across the dorsolateral side of the mandible. This structure is called the surangulodentary groove – because it extends from the dentary to the surangular. Unfortunately, its anterior and posterior ends cannot be confidently identified due to poor preservation (Fig. 1). The preserved length of the surangulodentary groove is deeply excavated and well-defined. This is another character that supports the affinity of *Ieldraan melkshamensis* with Geosaurini, as the groove is shallower and less clearly defined in Metriorhynchinae (Andrews 1913; Young *et al.* 2012b).

The lower jaw of NHMUK PV OR 46797 is weakly ornamented with the same bone texture of the skull, consisting of small oval pits and fine furrows, as in *Geosaurus* species (Young & Andrade 2009).

The posterior and dorsal sides of the dentary are fragmented but well exposed in lateral view (Figs 1, 3J–K). As in all metriorhynchids, the dentary it is the main element of the lower jaw, occupying the anterior and dorsal side of the mandible. The anterior, dorsal and posterior parts of the dentary are poorly preserved. This makes it impossible to measure the length of the tooth row. The dentary contacts the surangular and angular posteriorly and the splenial ventrally (Fig. 3F). The dorsolateral margin of the preserved dentary bears well-developed reception pits for the maxilla and premaxilla teeth. This feature, combined with the tri-faceted/enlarged teeth, and the short interalveolar distance, show that the maxillary dentition overbites the dentary dentition (see Dentition), as in *Geosaurus* (Young & Andrade 2009; Andrade *et al.* 2010; Young *et al.* 2012a).

Posteriorly, the dentary reaches half of the estimated length of the lower jaw and is marked by a straight-anteriorly-dipping suture with the surangular (Fig. 1). The relative position of this suture compared to the orbit is difficult to assess, but assuming that little relative movement occurred between the skull and lower jaws, it may be similar to the condition in *Geosaurus*. The position of the dentary and surangular suture has a significant phylogenetic importance in Thalattosuchia. In Metriorhynchinae it extends beyond the orbit, whilst in Geosaurinae it generally sits in line with the orbital area. However, in *Geosaurus giganteus* (NHMUK PV R 1229; NHMUK PV OR 37020) the surangular-dentary suture is approximately aligned with the anterior margin of the orbit (Young & Andrade 2009).

The dentary contacts the angular with a wedge-shaped suture (Figs 1, 3F). The anterior extent of this suture marks the triple contact amongst the dentary, angular and splenial, which is normally hidden in lateral view but well exposed in NHMUK PV OR

46797 (likely due to post-mortem deformation). The posterior part of the dentary-splenial suture is not visible in lateral view but it can be seen in ventral view from the side of the boulder. In life, this contact would have been ‘V’-shaped, with the posterior extent of the mandibular symphysis occupied by the splenials (Fig. 3F, K). As previously mentioned, the posterior part of the dentary is sulcated by the anterior extent of the surangulodentary groove.

The splenial is the main element of the medial side of the mandible. It is partially exposed in ventral view on one side of the boulder (Figs 1, 3F, K). It sits in anatomical association with the remaining elements of the lower jaw. In thalattosuchians, the splenial always participates in the symphyseal suture in both dorsal and ventral views (Andrews 1913). The extent of this involvement is generally extensive in metriorhynchids, where the splenial normally accounts for more than 20% of the entire length.

In ventral view, each splenial appears as an anteroposteriorly elongated triangle (Figs 3F). The anterior process tapers in between the midline interdentary suture with the other side splenial and the dentary dorsally. The posterior end of the splenial-splenial suture marks the end of the mandibular symphysis and it is the point where the divergence of the mandibular rami begins (Fig. 3F). Crucially, this point is visible in NHMUK PV OR 46797 and, combined with our estimate of mandibular length, allows calculation of the symphyseal area proportions. We estimate it to be ~25-30 cm long (~40% of the mandibular length), with the splenial involved for at least 50% of the symphysis length along the ventral midline. However, given the uncertainty of these estimates we decided against implementing these characters in our phylogenetic dataset.

The surangular occupies the posterodorsal part of each mandibular ramus, and in NHMUK PV OR 46797 it is not as well preserved as the dentary and angular (Fig. 1). Specifically, the eminence of the coronoid process was diagenetically broken and folded over onto the lateral surface of the surangular, but it is still visible projecting outside the dorsal margin of the lower jaw (Fig. 1). Several fractures eroded the superficial layer of the posterior surangular, but the remaining parts are enough to reveal that the ornamentation of this bone does not substantially differ from the rest of the mandible and skull. The surangular-angular suture can be easily identified and is also highlighted by a change of direction of the ornamental oval pits and grooves on the two bones. This suture describes a long, weakly dorsally concave curve. The surangular appears to be not as long and deep as in other metriorhynchids, although this may an artefact of deformation and preservation. Among metriorhynchids, *Geosaurus* also has a relatively small surangular (Young & Andrade 2009), suggesting this feature could be an apomorphy of Geosaurina.

The angular is the mandibular bone that sits ventral to the surangular and posterior to the dentary, and constitutes the posterior and ventral part of each mandibular ramus (Fig. 1). Its posterior ventral margin is weakly curved in lateral view as it is in *Geosaurus*, and opposed to the condition in *Tyrannoneustes lythrodectikos* (Young & Andrade 2009; Young *et al.* 2013b; Foffa & Young 2014), in which it is strongly curved, raising the glenoid fossa above the coronoid process. The anterior extent of the angular is a wedge shape process delimited by the dentary in dorsal view and by the splenial in ventral view. The latter contact excludes the angular from participating in the symphyseal suture (Figs 1, 3F).

Dentition. *Ieldraan melkshamensis* has thecodont tooth implantation (Figs 1, 4). This is evident in NHMUK PV OR 46797, even though all teeth are only preserved in labial view. There are a few consecutive tooth crowns emerging from the left premaxilla/maxilla and the middle section of the left dentary. The interalveolar spacing between them is small (generally smaller than half alveolar-distance), similar to *Geosaurus* spp. and other geosaurins (Wilkinson *et al.* 2008; Young *et al.* 2012a, 2012b).

In total, there are eleven visible crowns, of which five are well preserved. They are single cusped and bicarinated, with macroscopic strongly keeled carinae, which are particularly prominent in the apical half. The carinae are denticulated. These denticles are microscopic, nearly contiguous (yet unevenly distributed, often in aggregates of 5-10 denticles), isomorphic, unequally-sized and poorly-developed (not exceeding 300μm). This corresponds to microziphodonty, *sensu* Andrade *et al.* (2010) (Fig. 4) (but see Discussion). The denticles of *Ieldraan melkshamensis* are not homogeneous, but vary in size and shape. This is also observed in the geosaurine *'Metriorhynchus' brachyrhynchus* and basal geosaurin *Tyrannoneustes lythrodectikos* (Young *et al.* 2013b; Foffa & Young 2014), and differs from *Geosaurus* spp. (Andrade *et al.* 2010) in which the denticles are better defined and more tightly packed.

Geosaurus spp. and *Ieldraan melkshamensis* both have tooth crowns whose labial surfaces are divided into three apicobasal planes. However, uniquely among Metriorhynchidae, in NHMUK PV OR 46797 the middle plane is clearly fluted – sculpted by well-developed troughs/flutings separated by broad continuous, parallel and well developed ridges with a convex/flat profile (Fig. 4B). The number of troughs (five) is constant across the dentition, although it bears repeating that only a few teeth are preserved. The functional significance of this character, if any, is not clear. The consistent morphology, and absence of breaks, show that this feature is not diagenetic.

The troughs and the round-convex ridges between them that form the fluted surface should not be mistaken with the ornamentation of the crowns. The ornamentation proper is composed of small, densely-packed, discontinuous and poorly organised ridges that give the crown a rough texture to the enamel. These ridges gradually increase in size towards the apex of each tooth. The dentine ornamentation does not interact with the carinae; although the rugosity pattern approaches them, it stops before creating any false serration morphology

(Fig. 4A–B) (Young *et al.* 2014b). However, both ornamentation patterns interact with the fluted middle surface of the crown, as shown in figure 4. This pattern contrasts with all *Geosaurus* specimens, in which the crowns are largely unornamented on the labial surfaces. The only *Geosaurus* specimen with dentition that has observable lingual surfaces is an undescribed *Geosaurus* sp. from the Tithonian on England (MJML K461). Further investigation is ongoing to assess whether this specimen belongs to any known species of *Geosaurus.* Nevertheless, the labial sides of the teeth of MJML K461 are ornamented with fine apicobasal parallel ridges that do not extend further than half the apicobasal length of the crown.

The occurrence of troughs on teeth is an extremely rare feature in Metriorhynchidae, but this feature is not exclusively found in *Ieldraan melkshamensis.* Two geosaurine specimens – NHMUK PV R 3804 (the holotype of *'Metriorhynchus' cultridens*) and an undescribed geosaurin PETMG R248 (both from the Peterborough Member of the OCF) – also have teeth with fluting structures on the labial surface (Fig. 5B–D). It is important to state that the dental and cranial morphologies of these specimens – which probably belong to the same taxon – are clearly distinct from NHMUK PV OR 46797. In particular, the teeth of both NHMUK PV R 3804 and PETMG R248 are indistinguishable from each other (Fig. 5). The crowns are single cusped, moderately enlarged (up to nearly 3 cm in apicobasal length), laterally compressed, and have a high crown height/length ratio (up to 2.8). The D9 tooth in PETMG R248, and some isolated NHMUK PV R 3804 teeth, have weak ornamentation and troughs on their labial side, and no enamel ridges (shallow or high-relief) can be seen on the lingual surface (Fig. 5D–E).

The similarities between PETMG R248 and NHMUK PV R 3804 and *Ieldraan melkshamensis* are limited to the fluted tooth crowns (Table 1). Without verging into detailed cranial descriptions of PETMG R248 and NHMUK PV R 3804, their lower jaws, skulls and dentitions are very different from NHMUK PV OR 46797, in morphology and ornamentation (Table 1, 2; Fig. 5). In particular, the teeth of PETMG R248 and NHMUK PV R 3804 lack apicobasal facets on the labial surface; the carinae are not as prominent as in *Ieldraan melkshamensis* and bear well-formed isomorphic microscopic denticles that are non-contiguous along the entire carinae (Fig. 5D compared to Fig. 4). The flutings differ from those seen in *Ieldraan melkshamensis* in being less well-defined, and having generally more than five per tooth developed all around the labial surface and decreasing in apicobasal length approaching the carinae (conversely *Ieldraan* consistently has five parallel troughs which are all of the same length) (Fig. 5A–C). Notably, the flutings cannot be seen in all of the teeth of PETMG R248 and NHMUK PV R 3804, and we cannot exclude that they are restricted to those from the anterior dentary (the only tooth in situ for those two specimens is the D9 tooth of PETM R248). In summary, the combinations of these features and very distinct cranial morphology and ornamentation clearly demonstrate that these specimens cannot be referred to *Ieldraan* (Table 1, 2).

Phylogenetic analysis

We tested the phylogenetic relationships of *Ieldraan melkshamensis* using a slightly modified version of the second dataset of Young *et al.* (2016) (Fig. 6). The dataset comprises 104 crocodylomorph OTUs (of which 65 are thalattosuchians, including 41 metriorhynchoids) scored for 298 characters. Compared to the previous version, our new dataset includes some modified scores for *Ieldraan melkshamensis* (which was included in the previous version, where it was labelled as ‘Melksham Monster’) based on our study of the specimen (see

Supporting Information). Despite its poor preservation, *Ieldraan melkshamensis* is scored for 44 out of 298 characters (14.8%).

The parsimony analysis of the dataset was conducted using TNT 1.5 (Willi Hennig Society Edition; Goloboff *et al.* 2008). We followed the procedure of Young *et al.* (2016) using the 'New Technology search' option in TNT (Sectorial Search, Ratchet, Drift, and Tree fusing) with 1000 random-addition replicates (RAS). We increased to 1000 the iterations of each method: in the Sectorial Search: 1000 Drift cycles (for selections of above 75) and 1000 starts and fuse trees 1000 times (for selections below 75); 1000 rounds of Consensus Sectorial Searches (CSSs) and Exclusive Sectorial Searches (XSSs). Ratchet 1000 ratchet iterations set to stop the perturbation when 1000 substitutions were made or 99% of the swapping was reached Drift: 1000 Drift cycles also set to stop the perturbation when 1000 substitutions were made or 99% of the swapping was reached. We set three rounds of Tree fusing.

Similarly, we used the same method described in Young *et al.* (2016) to calculate nodal support. Non-parametric bootstrapping was once again run using 'New technology search' option with 1000 replicates using 100 RAS for the following advanced search methods: Sectorial Search: 100 sectorial search drifting cycles for selections of above 75; 100 start trees and fused trees 100 times below 75, with 100 rounds of CSSs and XSSs. Ratchet: 100 Ratchet iterations, with the perturbation phase set to stop when 100 substitutions were made or when 99% of the swapping was completed. Drift: 100 cycles of Drift, which would stop the perturbation phase when 100 substitutions were made or when 99% of the swapping was complete. Finally, we set three round of Tree fusing.

The time-calibrated strict consensus trees of Geosaurinae (Figs 7, 8) were produced using the package 'strap' in R (R Core Team 2013; Bell & Lloyd 2015).

Results

The analysis produced 234 most parsimonious cladograms (with descriptive statistics of: length = 944 steps; CI = 0.413; RI = 0.827; CR = 0.341; HI = 0.587), the strict consensus of which gave the same topology as that reported by Young *et al.* (2016) (Fig. 6). As such, our re-scoring of *Ieldraan melkshamensis* has not altered its phylogenetic position. Therefore, herein we shall focus on solely on the Metriorhynchidae and Geosaurinae part of the topology (for discussion on the entire topology, consult the results and discussion sections of Young *et al*., 2016). Thalattosuchia is recovered sister group to Crocodyliformes, as was suggested by Wilberg (2015). Thalattosuchia is also found to be monophyletic and is further subdivided in two monophyletic groups, Teleosauroidea and Metriorhynchoidea. Within the latter group, *Zoneait nagorum* is in a polytomy with a metriorhynchoid from Chile and Metriorhynchidae (see Wilberg 2015; Young *et al.* 2016). In Metriorhynchidae, the subfamilies Metriorhynchinae and Geosaurinae are recovered, and so is the tribe Geosaurini within the latter subfamily. *Ieldraan melkshamensis* is deeply nested within Geosaurinae as the most basal and oldest member of Geosaurina, which also includes two species of *Geosaurus*.

Discussion

Middle Jurassic origin of all geosaurin groups

There are four major lineages of geosaurins, each of which leads to a particular derived taxon: *Torvoneustes*, *Plesiosuchus, Dakosaurus* and *Geosaurus* (Figs 6, 7, 8). Our phylogenetic analysis shows that all four of these lineages were already present in the Callovian. Key to this discovery is the reassessment and phylogenetic position of the most basal members of these respective lineages: *Tyrannoneustes lythrodectikos*, *Suchodus* *durobrivensis*, 'Mr Leeds' Dakosaur' (NHMUK PV R 3321), and now *Ieldraan melkshamensis*. This ongoing work has radically changed our understanding of geosaurin evolution. Before the description of the oldest known geosaurin *Tyrannoneustes lythrodectikos* (OCF, Callovian) (Young *et al.* 2013b), the oldest member of the Geosaurini clade was Late Jurassic in age. Subsequently, *Tyrannoneustes lythrodectikos* was found to be the sister taxon to Geosaurini, pushing the origin of wide-gape macrophagy back by at least 10 Ma, into the late-Middle Jurassic (Young *et al.* 2013b). Before the current manuscript, the early Kimmeridgian was the earliest time during which there was evidence that the four geosaurin lineages had definitely split (Young *et al.* 2014c). Recent re-evaluations of several misinterpreted Callovian specimens – and their inclusion as OTUs in phylogenetic analyses – has now changed this view (Fig. 8).

The phylogenetic analysis of Young *et al.* (2016) was the first to suggest Geosaurini originated in the late-Middle Jurassic. *Tyrannoneustes lythrodectikos* was found to be a member of Geosaurini rather than its sister taxon, and several other poorly studied OCF taxa were found to be members of Geosaurini. Our rescoring of the 'Melksham Monster' (as *Ieldraan melkshamensis* was called in Young *et al.* (2016)) based on our detailed study of the specimen (which itself was predicated by the detailed preparation of the material) has not changed the internal relationships of Geosaurini. However, our analysis does present a new evolutionary arrangement for macrophagous metriorhynchids. Geosaurini is found to be monophyletic, and split into two monophyletic groups (Figs 6–8). Group one (='subclade T') has the Callovian *Tyrannoneustes* as the basal-most taxon, with a derived Late Jurassic subclade consisting of *'Metriorhynchus' hastifer* + *Torvoneustes*. Group two comprises Geosaurina, Plesiosuchia and "Dakosaurina". Geosaurina is found as the sister taxon to a clade of broad-short snouted geosaurins (Plesiosuchia and "Dakosaurina"). The different position of *Tyrannoneustes* and the phylogenetic affinities of *Ieldraan melkshamensis* both bear crucial consequences for the time and mode of diversification of Geosaurini.

In particular, the sudden Late Jurassic diversity of macrophagous geosaurins now appears less abrupt than previously suggested, as we now know that it had a long phylogenetic and temporal fuse. Undeniably, geosaurins still constituted a very small component (taxic and numerical; see also Young 2014) of the late Middle Jurassic ecosystems, but the new discoveries suggest that all the major groups – once supposed to be exclusively Late Jurassic – were already present approximately 10 Ma before the previous estimates. This also means that most of the key macrophagous adaptations known in Kimmeridgian-Tithonian taxa were already present in the Callovian. Yet the mechanisms that turned the Middle Jurassic metriorhynchine/teleosaurid-dominated thalattosuchian fauna of the OCF to the Late Jurassic geosaurin-dominated fauna in the Kimmeridge Clay Formation are still unknown (see Young 2014). The reason for this is that the Callovian–Kimmeridgian transition was a time of deep faunal turnover in marine ecosystems – severely affecting all the marine amniote groups (Benton & Spencer 1995; Young 2014; Foffa *et al.* 2015). Unfortunately, our understanding of this subject is hampered by the poor fossil record of the intermediate layers of the Oxfordian (the so-called 'Corallian Gap', Young 2014).

Evolution of ziphodonty dentition in Geosaurini

The evolution of ziphodonty in Geosaurinae has been extensively studied (Andrade *et al.* 2010; Young *et al.* 2012a, 2012b, 2013b). In this section we update this topic in light of new data, our description of the *Ieldraan melkshamensis* holotype and our phylogenetic analysis (Table 2, Fig. 8). In doing this, we adopt a nomenclature that in our view has the merit of taking into account the functionality of each morphological type of serration (Table 2). Two distinct characteristics must be considered when describing true ziphodonty:

i. denticle development that describes the size and how clearly defined denticles are (e.g. incipient, poorly-developed, well-developed), and

ii. denticle arrangement along the carinae (e.g. do they form a contiguous row along the carinae, or are they simply forming short (2-10) repeat units?).

These terms must not be confused, as they describe different aspects of denticle morphology. Specifically, it is the co-occurrence of the different states of denticle development and arrangement that regulate the presence absence of 'functionally' serrated edges (see Table 2). As a clear nomenclature is essential to precisely capture the morphological and functional differences amongst variety of ziphodont dentitions in Geosaurinae, we summarise the fundamental definitions in the next section.

Ziphodonty is defined *"as dentitions where all teeth possess denticulated carinae, comprised of true denticles"* (in Andrade & Young (2009) based on Prasad & Broin 2002).We adopt the terms 'false serrations' and 'true denticle' with the same meaning as introduced by Prasad & Broin (2002). Macroziphodonty, microziphodonty and 'incipient (micro)ziphodonty' were defined in Young *et al.* (2013). The latter was introduced to cover those morphologies where the denticles were poorly defined and/or the denticles do not form a contiguous row along the keel. These definitions are based on external morphologies rather than internal ones – i.e. denticles are serrations in which the dentine also contributes. This cross-sectional definition, although is in use by other authors, are beyond the scope of this study.

The most derived geosaurin taxa (*Torvoneustes*, *Plesiosuchus, Dakosaurus* and *Geosaurus*), have distinct serration morphologies, which are perhaps linked to functional partitioning of resources (Andrade *et al.* 2010, Young *et al.* 2012a, 2012b, 2013b). Indeed, the phylogenetic position and dental morphology of *Ieldraan melkshamensis* (and recently added basal members of each lineage) help to explain the occurrence of four different serration morphologies in Geosaurini. The evolutionary history of these characters has been long debated, and to date can be summarised using two alternative scenarios:

1) Functional true ziphodonty evolved at the base of Geosaurini. In this hypothesis, true ziphodonty (i.e. presence well-developed denticles that are contiguous along the carinae) would have followed different evolutionary trajectories (maybe because of different mechanical/feeding-related needs) in *Torvoneustes, Geosaurus, Dakosaurus* and *Plesiosuchus* (Pol & Gasparini 2009; Young & Andrade 2009; Andrade *et al.* 2010; Young *et al.* 2012b, 2013a). In this scenario, the most recent common ancestor of Geosaurini had functionally serrated carinae (microziphodonty).

2) True, functional ziphodont carinae evolved independently at least four times in Geosaurini, once in the *Geosaurus* lineage, once (or perhaps twice, pending reassessment of *Suchodus durobrivensis*) in the *Dakosaurus* and *Plesiosuchus* subclade, and finally in *Torvoneustes*. In this scenario, the most recent common ancestor of Geosaurini did not have functionally serrated carinae but poorly developed non-contiguous denticles on the carinae (‘incipient’ microziphodonty).

Our description of *Ieldraan melkshamensis* combined with the phylogenetic analysis of Young *et al.* (2016) helps us to discriminate between these hypotheses. While both can explain the evolution of the very different denticle morphologies in derived Geosaurini genera, we argue that the dental features of *Ieldraan melkshamensis,* (and indeed *Tyrannoneustes lythrodectikos*, *Suchodus durobrivensis,* and Mr. Leeds’ Dakosaur) better support the second hypothesis (Fig. 8).

First, the closest sister taxon to Geosaurini is *‘Metriorhynchus’ brachyrhynchus*, a non–geosaurin geosaurine from the Callovian. This species has microscopic poorly formed denticles, which are not contiguous (Figs 5, 8, Tables 1, 2) (Young *et al.* 2013b). Unfortunately, no information is available for other non–geosaurin geosaurines (Fig. 8).

Tyrannoneustes lythrodectikos, previously considered to be the sister taxon to Geosaurini, is now found to be a basal member of a large subclade including *Torvoneustes* (Young *et al.* 2016; Figs 6–8). However, the dentition of *Tyrannoneustes* is similar to '*Metriorhynchus*' *brachyrhynchus* in having poorly developed non-contiguous microscopic true denticles (Young *et al.* 2013b). Similarly, the denticles of *Ieldraan melkshamensis* are also poorly developed, are irregularly spaced along the carinae, and do not form a clear serrated edge (so that they do not alter the height of the keel; *sensu* Young *et al.* 2013b). The macrophotographs (Figs 4) clearly show that the denticles of *Ieldraan melkshamensis* were less developed than the denticles of *Geosaurus* (*Geosaurus* sp. SMNS 81834 and MJML K461; *G. grandis* BSPG AS-VI-1; *G. giganteus* NHMUK PV OR 37020) (Young & Andrade 2009; Andrade *et al.* 2010) (Table 2).

The most striking consequence of this re-evaluation is that the basal-most member of two geosaurin lineages (*Tyrannoneustes* and *Ieldraan*) have 'incipient', non-contiguous microziphodont dentition. In other words, OCF geosaurin taxa had poorly developed (unevenly sized), non-contiguous and microscopic (<300 μm) denticles that do not form a functional serrated edge along the carinae (Andrade *et al.* 2010; Young *et al.* 2013b). The notable exception to this is NHMUK PV R 486, the oldest known *Dakosaurus*-like tooth, discovered in an unknown horizon of the OCF (see figure 2 in Young *et al.* 2013b). The carinae on this tooth have the homogeneous, isomorphic, and closely packed denticles that are characteristic of *Geosaurus*, *Plesiosuchus* and *Dakosaurus* (Andrade *et al.* 2010). Within this context, *Torvoneustes*, however, has a unique functional ziphodont morphology, in which the denticles are contiguous along the carinae but are poorly defined (Andrade *et al.* 2010; Barrientos-Lara *et al.* 2016). Two species, *Torvoneustes carpenteri* and *T. mexicanus*, have true ziphodonty and false ziphodonty, with the superficial enamel ornamentation contacting the carinal keel (Andrade *et al.* 2010; Young *et al.* 2013b; Barrientos-Lara *et al.* 2016).

Interestingly, the geologically oldest *Torvoneustes* species, *T. coryphaeus*, does not have teeth with the enamel ornamentation contacting the keel (Young *et al.* 2013a).

Therefore, the plesiomorphic condition in Geosaurini could be poorly developed and non-contiguous microscopic denticles (‘incipient’ microziphodonty). This condition would have given rise to at least three independent true ziphodont morphologies, namely once in *Torvoneustes,* once in *Geosaurus*, once (or twice?) in *Dakosaurus* + *Plesiosuchus* subclade (Fig. 8). Future discoveries and re-descriptions of key specimens are currently underway, and, coupled with an improved species-level phylogeny, will allow us to further test the two hypotheses of dental evolution in Geosaurini.

Conclusions

Based on our description of a long overlooked and misinterpreted specimen (NHMUK PV OR 46797), we establish a new taxon *Ieldraan melkshamensis* gen. et sp. nov. Despite the poor state of preservation, we demonstrate that this late Middle Jurassic taxon from the OCF shows remarkable similarities with the Late Jurassic genus *Geosaurus. Ieldraan* and *Geosaurus* are found to be sister taxa in a new European endemic, Callovian–Valanginian geosaurin lineage that we named Geosaurina subtr. nov. The morphology and stratigraphic occurrence of *Ieldraan melkshamensis*, combined with our phylogenetic analysis, demonstrate that numerous adaptations linked to macrophagy had already evolved in Geosaurini by the Callovian stage. This suggests that the diversification of the tribe was perhaps less abrupt than previously thought, but rather had a longer temporal and phylogenetic fuse. We also show that the evolution of ziphodonty followed a different path than previously hypothesised. The new information presented here indicates that four different true ziphodont morphologies in the derived Late Jurassic geosaurins independently evolved from a unique non-functional microziphodont common ancestor.

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References

Andrade, M. B. & Bertini, R. J. 2008. Morphology of the dental carinae in *Mariliasuchus amarali* (Crocodylomorpha, Notosuchia) and the pattern of tooth serration among basal Mesoeucrocodylia. *Arquivos do Museu Nacional*, **66**, 63–82.

Andrade, M. B., Young, M. T., Desojo, J. B. & Brusatte, S. L. 2010. The evolution of extreme hypercarnivory in Metriorhynchidae (Mesoeucrocodylia: Thalattosuchia) based on evidence from microscopic denticles morphology. *Journal of Vertebrate Paleontology*, **30**, 1451–1465.

Andrews, C.W. 1913. *A Descriptive Catalogue of the Marine Reptiles of the Oxford Clay, Part Two.* British Museum (Natural History), London, 206 pp.

Barrientos-Lara, J. I., Herrera Y., Fernández, M. S. & Alvarado-Ortega J. 2016. Occurrence of *Torvoneustes* (Crocodylomorpha, Metriorhynchidae) in marine Jurassic deposits of Oaxaca, Mexico. *Revista Brasileira de Paleontologia*, **19(3)**, 415–424. doi:10.4072/rbp.2016.3.07.

Bell, M. A. & Lloyd, G. T. 2015. strap: an R package for plotting phylogenies against stratigraphy and assessing their stratigraphic congruence. *Palaeontology*, **58**, 379–389. doi:10.1111/pala.12142

Benton, M. J. & Spencer, P. S. 1995. *Fossil reptiles of Great Britain.* London: Chapman and Hall, ed; 1995, 386 pp.

Brusatte, S. L., Muir, A., Young, M. T., Walsh, S., Steel, L. & Witmer, L. M. 2016. The Braincase and Neurosensory Anatomy of an Early Jurassic Marine Crocodylomorph: Implications for Crocodylian Sinus Evolution and Sensory Transitions. *The Anatomical Record*, **299**, 1511–1530.

Cau, A. & Fanti. F. 2011. The oldest known metriorhynchid crocodilian from the Middle Jurassic of North-eastern Italy: *Neptunidraco ammoniticus* gen. et sp. nov. *Gondwana Research*, **19**, 550–565.

Cau, A. 2013. The affinities of *'Steneosaurus barettoni'* (Crocodylomorpha,Thalattosuchia), from the Jurassic of Northern Italy, and implications for cranial evolution among geosaurine metriorhynchids. *Historical Biology*, **26**, 433–440.

Chiarenza, A. A., Foffa, D., Young, M. T., Insacco, G., Cau, A., Carnevale, G. & Catanzariti, R. 2015. The youngest record of metriorhynchid crocodylomorphs, with implications for the extinction of Thalattosuchia. *Cretaceous Research*, **56**, 608–616. http://dx.doi.org/10.1016/j.cretres.2015.07.001

Cuvier, G. 1824. Article IV Des os de deux espèces inconnues de Gavials; trouvés pêle-mêle près de Honfleur et du Hâvre. Sur les Ossemens Fossiles.Nouvelle édition, Tome Cinquieme, Partie 2 Paris: Dufour & d'Occagne, 143–160.

Eudes-Deslongchamps, E. 1867–1869. *Notes paléontologiques.* Caen and Paris: Le Blanc Hardel et Savy, 320–392.

Fernández, M. S., Carabajal, A. P., Gasparini, Z. & Chong Díaz, G. 2011. A metriorhynchid crocodyliform braincase from northern Chile. *Journal of Vertebrate Paleontology*, **31**, 369–377.

Fitzinger, L. J. F.J. 1843. *Systema reptilium.* Wien: Braumüller et Seidel, 136 pp.

Foffa, D. & Young, M. T. 2014. The cranial osteology of *Tyrannoneustes lythrodectikos* (Crocodylomorpha: Metriorhynchidae) from the Middle Jurassic of Europe. *PeerJ* 2:e608;DOI 10.7717/peerj.608.

Foffa, D., Young, M. T. & Brusatte, S. L. 2015. Evidence of macrophagous teleosaurid crocodylomorphs in the Corallian Group (Oxfordian, Late Jurassic) of the UK. *PeerJ* 3:e1497https://doi.org/10.7717/peerj.1497

Fraas, E. 1901. Die Meerkrokodile (Thalattosuchia n. g.) eine neue Sauriergruppe der Juraformation. *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg*, **57**, 409–418.

Fraas, E. 1902. Die Meer-Krocodilier (Thalattosuchia) des oberen Jura unter specieller Berucksichtigung von *Dacosaurus* und *Geosaurus*. *Palaeontographica*, **49**, 1–72.

Goloboff, P. A., Farris, J. S. & Nixon, K. C. 2008. TNT, a free program for phylogenetic analysis. *Cladistics*, **24**, 1–13.

Hay, O. P. 1930. *Second Bibliography and Catalogue of the Fossil Vertebrata of North America 2.* Carnegie Institute Washington, Washington, D.C., 1074 pp.

Hendry, J. P., Pearson, M. J., Trewin, N. H. & Fallick, A. E. 2006, Jurassic septarian concretions from NW Scotland record interdependent bacterial, physical and chemical processes of marine mudrock diagenesis. *Sedimentology*, **53**, 537–565. doi:10.1111/j.1365-3091.2006.00779.x

Herrera, Y., Gasparini, Z. & Fernández, M.S. 2013. A new Patagonian species of *Cricosaurus* (Crocodyliformes, Thalattosuchia): first evidence of *Cricosaurus* in Middle–Upper Tithonian lithographic limestones from Gondwana. *Palaeontology*, **56**, 663–678.

Herrera, Y., Gasparini, Z. & Fernández, M. S. 2015. *Purranisaurus potens* Rusconi, an enigmatic metriorhynchid from the Late Jurassic–Early Cretaceous of the Neuquén Basin. *Journal of Vertebrate Paleontology*, DOI: 10.1080/02724634.2014.904790.

Jouve, S. 2009. The skull of *Teleosaurus cadomensis* (Crocodylomorpha; Thalattosuchia), and phylogenetic analysis of Thalattosuchia. *Journal of Vertebrate Paleontology*, **29**, 88–102.

Lepage, Y., Buffetaut, E., Hua, S., Martin, J. E. & Tabouelle, J. 2008. Catalogue descriptif, anatomique, geologique et historique des fossiles presentes a l'exposition «Les crocodiliens fossiles de Normandie» (6 novembre – 14 decembre 2008). *Bulletin de la Société Géologique de Normandie et des Amis du Muséum du Havre*, **95**, 5–152.

Lydekker, R. 1889. On the remains and affinities of five genera of Mesozoic reptiles. *Quarterly Journal of the Geological Society*, **45**, 41–59.

Mannion, P. D., Benson, R. B. J., Carrano, M. T., Tennant, J. P., Ludd, J. & Butler, R. J. 2015. Climate constrains the evolutionary history and biodiversity of crocodylians. *Nature Communications*, **6**, 8438 doi: 10.1038/ncomms9438.

Montefeltro, F. C., Andrade, D. V. & Larsson, H. C. E. 2016. The evolution of the meatal chamber in crocodyliforms. *Journal of Anatomy*, **228 (5)**, 838–863. DOI: 10.1111/joa.12439.

Parrilla-Bel, J., Young, M. T., Moreno-Azanza, J. & Canudo, J. I. 2013. The first metriorhynchid crocodylomorph from the Middle Jurassic of Spain, with implications for evolution of the subclade Rhacheosaurini. *PLoS ONE*, **8,** e54275. doi: 10.1371/journal.pone.0054275.

Pol, D. & Gasparini, Z. 2009. Skull anatomy of *Dakosaurus andiniensis* (Thalattosuchia: Crocodylomorpha) and the phylogenetic position of Thalattosuchia. *Journal of Systematic Palaeontology*, **7**, 163–197.

Prasad, G. V. P. & Broin, F. L. 2002. Late Cretaceous crocodile remains from Naskal (India): comparisons and biogeographic affinities. *Annales de Paléontologie*, **88**, 19–71.

R Core Team (2013). *R: A language and environment for statistical computing.* R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.

Sellés-Martínez, J. 1996. Concretion morphology, classification and genesis. *Earth-Science Reviews*, **41**, 177–210. doi:10.1016/S0012-8252(96)00022-0.

Walker, A. D. 1970. A revision of the Jurassic reptile *Hallopus victor* (Marsh), with remarks on the classification of crocodiles. *Philosophical Transactions of the Royal Society of London, Series B*, **257**, 323–372.

Wilberg, E. W. 2015. A new metriorhynchoid (Crocodylomorpha, Thalattosuchia) from the Middle Jurassic of Oregon and the evolutionary timing of marine adaptations in thalattosuchian crocodylomorphs. *Journal of Vertebrate Paleontology*, 10.1080/02724634.2014.902846.

Wilkinson, L. E., Young, M. T. & Benton, M. J. 2008. A new metriorhynchid crocodile (Mesoeucrocodylia: Thalattosuchia) from the Kimmeridgian (Upper Jurassic) of Wiltshire, U.K. *Palaeontology*, **51**, 1307–1333.

Young, M. T. 2014. Filling the 'Corallian Gap': re-description of a metriorhynchid crocodylomorph from the Oxfordian (Late Jurassic) of Headington, England, *Historical Biology*, **26:1**, 80–90.

Young, M. T. & Andrade, M. B. 2009. What is *Geosaurus*? Redescription of *Geosaurus giganteus* (Thalattosuchia: Metriorhynchidae) from the Upper Jurassic of Bayern, Germany. *Zoological Journal of the Linnean Society*, **157**, 551–585.

Young, M. T., Brusatte, S. L., Ruta, M. & Andrade, M. B. 2010. The evolution of Metriorhynchoidea (Mesoeucrocodylia, Thalattosuchia): an integrated approach using geometric morphometrics, analysis of disparity and biomechanics. *Zoological Journal of the Linnean Society*, **158**, 801–859.

Young, M. T., Bell, M. A. & Brusatte, M. B. 2011a. Craniofacial form and function in Metriorhynchidae (Crocodylomorpha: Thalattosuchia): modelling phenotypic evolution with maximum likelihood methods. *Biology Letters*, **7**, 913–916.

Young, M. T., Brusatte, S. L. & Andrade, M. B. 2011b. Body size estimation and evolution in metriorhynchid crocodylomorphs: implications for species diversification and niche partitioning. *Zoological Journal of the Linnean Society*, **163(4)**, 1199–1216. DOI 10.1111/j.1096-3642.2011.00734.x.

Young, M. T., Brusatte, S. L., Andrade, M. B., Desojo, J. B., Beatty, B. L., Steel, L., Fernández, M. S., Sakamoto, M., Ruiz-Omeñaca, J. I. & Schoch, R. R. 2012a. The cranial osteology and feeding ecology of the metriorhynchid crocodylomorph genera *Dakosaurus* and *Plesiosuchus* from the Late Jurassic of Europe. *PLoS ONE*, **7**, e44985. doi: 10.1371/journal.pone.0044985.

Young, M. T., Brusatte, S. L., Andrade, M. B., Beatty, L. & Desojo, J. B. 2012b. Tooth-On-Tooth Interlocking Occlusion Suggests Macrophagy in the Mesozoic Marine Crocodylomorph *Dakosaurus*. *The Anatomical Record*, **295**, 1147–1158.

Young, M. T., Andrade, M. B., Etches, S. & Beatty, B. L. 2013a. A new metriorhynchid crocodylomorph from the Lower Kimmeridge Clay Formation (Late Jurassic) of England, with implications for the evolution of dermatocranium ornamentation in Geosaurini. *Zoological Journal of the Linnean Society*, **169**, 820–848.

Young, M. T., Andrade, M. B. Brusatte, S. L., Sakamoto, M. & Liston, J. 2013b. The oldest known metriorhynchid super-predator: a new genus and species from the Middle Jurassic of England, with implications for serration and mandibular evolution in predacious clades. *Journal of Systematic Palaeontology*, **11**, 475–513.

Young, M. T., Hua, S., Steel, L., Foffa, D., Brusatte, S. L., Thüring, S., Mateus, O., Ruiz-Omeñaca, J. I., Havlik, P., Lepage, Y. & Andrade, M. B. 2014a. Revision of the Late Jurassic teleosaurid genus *Machimosaurus* (Crocodylomorpha, Thalattosuchia). *Royal Society Open Science*, **1**, 140222. http://dx.doi.org/10.1098/rsos.140222.

Young, M. T., Steel, L., Brusatte, S. L., Foffa, D. & Lepage, Y. 2014b. Tooth serration morphologies in the genus *Machimosaurus* (Crocodylomorpha, Thalattosuchia) from the

Late Jurassic of Europe. *Royal Society Open Science*, **1**, 140269. http://dx.doi.org/10.1098/rsos.140269.

Young, M. T., Steel, L. & Middleton, H. 2014c. Evidence of the metriorhynchid crocodylomorph genus *Geosaurus* in the Lower Kimmeridge Clay Formation (Late Jurassic) of England. *Historical Biology*, **26(5)**, http://dx.doi.org/10.1080/08912963.2013.801468

Young, M. T., Hastings, A. K., Allain, R. & Smith, T. J. 2016. Revision of the enigmatic crocodyliform *Elosuchus felixi* de Lapparent de Broin, 2002 from the Lower–Upper Cretaceous boundary of Niger: potential evidence for an early origin of the clade Dyrosauridae. *Zoological Journal of the Linnean Society*, doi:10.1111/zoj.12452

Figure captions

Figure 1. Skull and left mandibular ramus of *Ieldraan melkshamensis* gen. et sp. nov. (NHMUK PV OR 46797), and line interpretation in dorsolateral view. Refer to the main text for abbreviations. The dashed line represents the approximate boundary of the left supratemporal fenestra; the dot-dashed line indicates the approximate position of the left orbit; the dotted line indicates the approximate position of the left meatal chamber; the cross-hatched pattern indicates damaged surfaces of the bone.[planned for whole page width]

Figure 2. Skull and left mandibular ramus of *Ieldraan melkshamensis* gen. et sp. nov. (NHMUK PV OR 46797), and line interpretations. **A,** occipital view; **B,** oblique occipital view A. Refer to the main text for abbreviations. [planned for whole page width]

Figure 3. Details of the skull and left mandibular ramus of *Ieldraan melkshamensis* gen. et sp. nov. and line interpretation of a generic metriorhynchid skull showing the diagenetic preservation of the specimen. **A,** Close up of the frontal, prefrontal and postorbital area; **B,**

close up of the right prefrontal. The dotted line represent the prefrontal-frontal suture; **C,** close up of the posterior-medial corner of the left supratemporal fossa; **D,** close up of one fragment of the left maxilla (reception pits, nutritious foramina and bone ornamentations are visible); **E,** close up of the occipital complex; **F,** left mandibular ramus in ventral view, showing the angular, splenial and dentary contacts and the end of the mandibular symphysis; **G,** lateral view of the left postorbital bar (supratemporal fenestra, orbit and meatal chamber are highlighted); **H,** skull line interpretation in dorsal view; **I,** skull line interpretation in lateral view; **J,** mandible line interpretation in lateral view; **K,** simplified line interpretation of NHMUK PV OR 46797, showing the main skull elements and major line of fractures (red lines). The dashed line represents the approximate boundary of the left supratemporal fenestra; the dot-dashed line indicates the approximate position of the orbit; the arrow in **C,** indicates a blood vessel/nerve foramen (see text for further discussion); the dashed grey areas in **H–K** indicate heavily fragmented or missing areas. Red lines in **K** indicate the principal fractures in the concretion. Refer to the main text for abbreviations. [planned for whole page width]

Figure 4. Close-up of a dentary tooth of *Ieldraan melkshamensis* gen. et sp. nov. (NHMUK PV OR 46797). **A,** Dentary tooth in labial side with detail of bone texture (black arrow); **B,** schematic cross-section of a tooth; **C,** dentary tooth close-up showing the carina and denticles (white arrow) in labial side. [planned for half-page width]

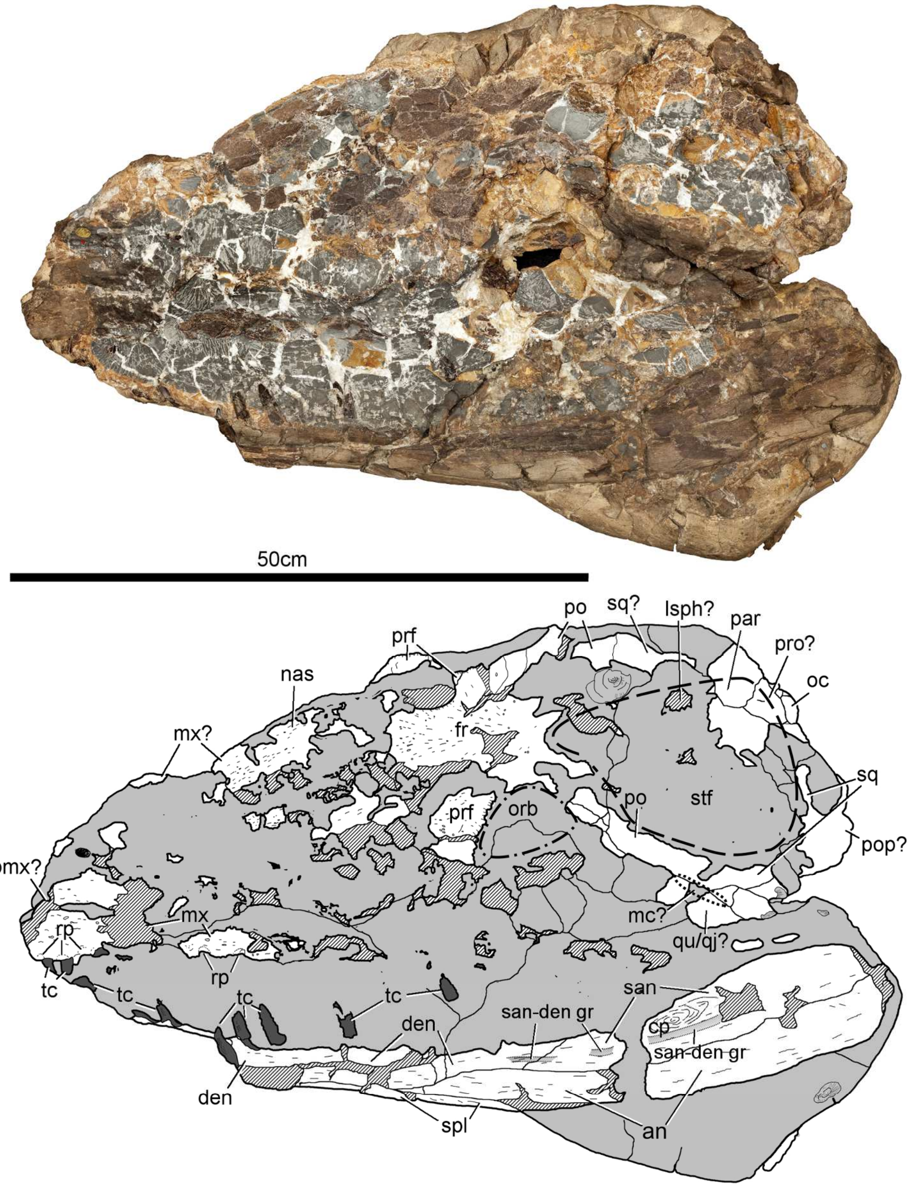
Figure 5. Comparative plate of fluted teeth and basal tuberosities in geosaurin taxa. **A,** *Ieldraan melkshamensis* (NHMUK PV OR 46797) dentary tooth; **B,** *'Metriorhynchus' brachyrhynchus* (NHMUK PV R 3804) isolated tooth; **C**, indeterminate geosaurin (PETMG R248) in labial view; **D,** indeterminate geosaurin (PETMG R248) in carinal view; **E,** indeterminate geosaurin (PETMG R248) in lingual view. Note the different flutings and carinal morphology; **F,** occipital view of *Ieldraan melkshamensis* (NHMUK PV OR 46797)

basioccipital; **G,** occipital view of *'Metriorhynchus' brachyrhynchus* (NHMUK PV R 3804) basioccipital. Note the difference in relative size between the basal tuberosities of the two taxa. [planned for whole page width]

Figure 6. Simplified strict consensus tree of the 234 most parsimonious cladograms of Metriorhynchidae within Crocodylomorpha. Bootstraps values are reported below each node, **absolute**/relative Bremer support values are reported above each node in grey. [planned for whole page width]

Figure 7. Time-calibrated phylogenetic tree of Geosaurinae. [planned for whole page width]

Figure 8. Time-calibrated cladograms of Geosaurinae with mapped different ziphodonty morphologies. Our tree (left) is compared to a modified version of Young (2014) and Young *et al.* (2013b) topology (right). Notice the how the addition of new Middle Jurassic OTUs improved resolving Geosaurini inner relationships and changed our understanding of the time and mode of ziphodonty evolution within the group. The black arrows indicate the lineages where ziphodonty was acquired. [planned for whole page width]



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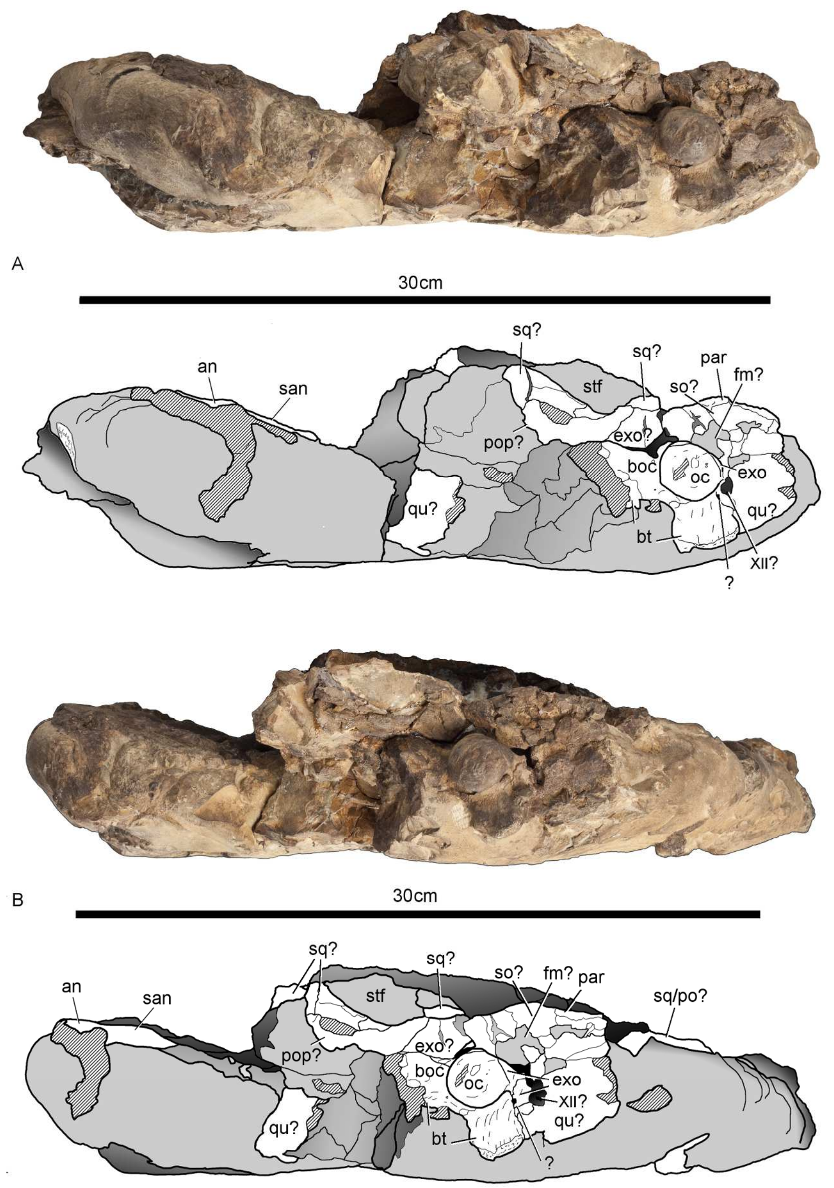

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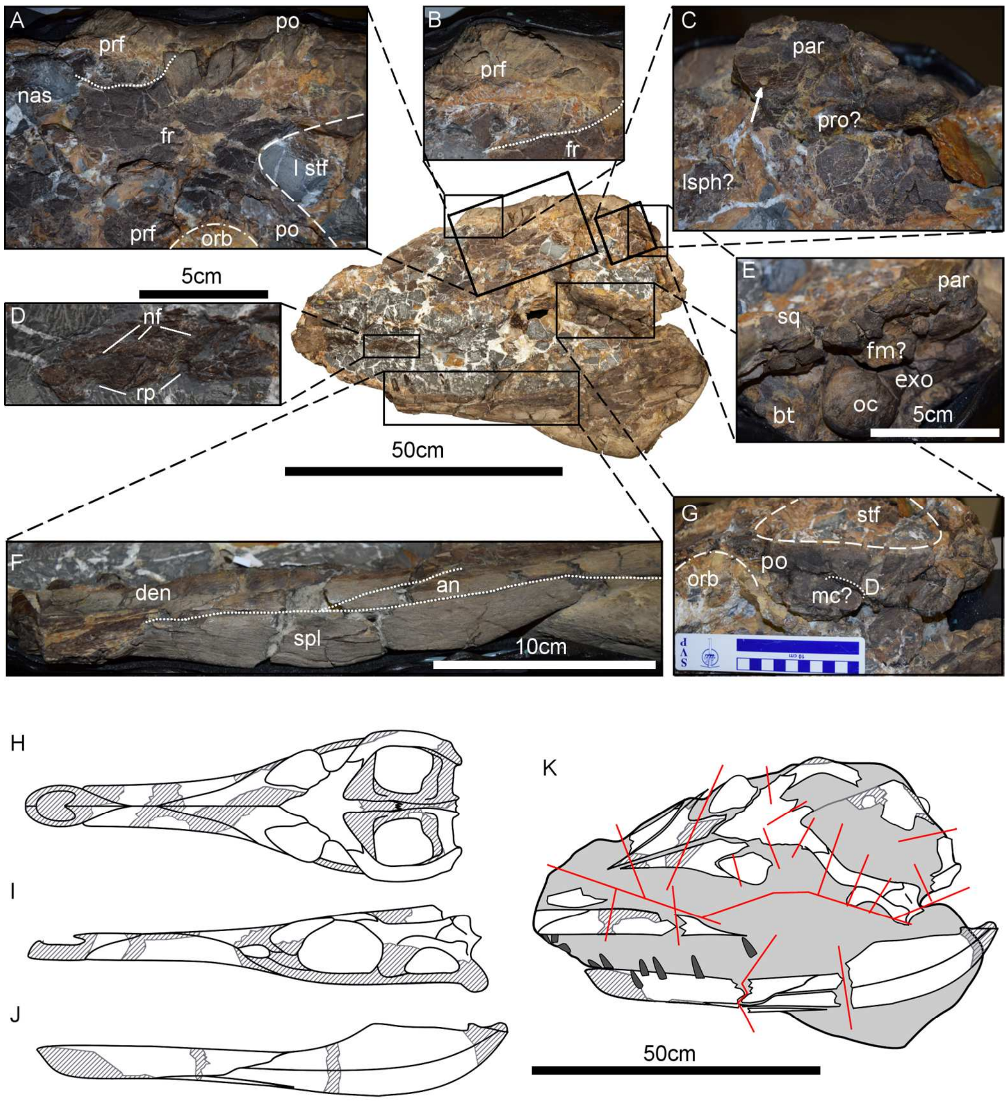

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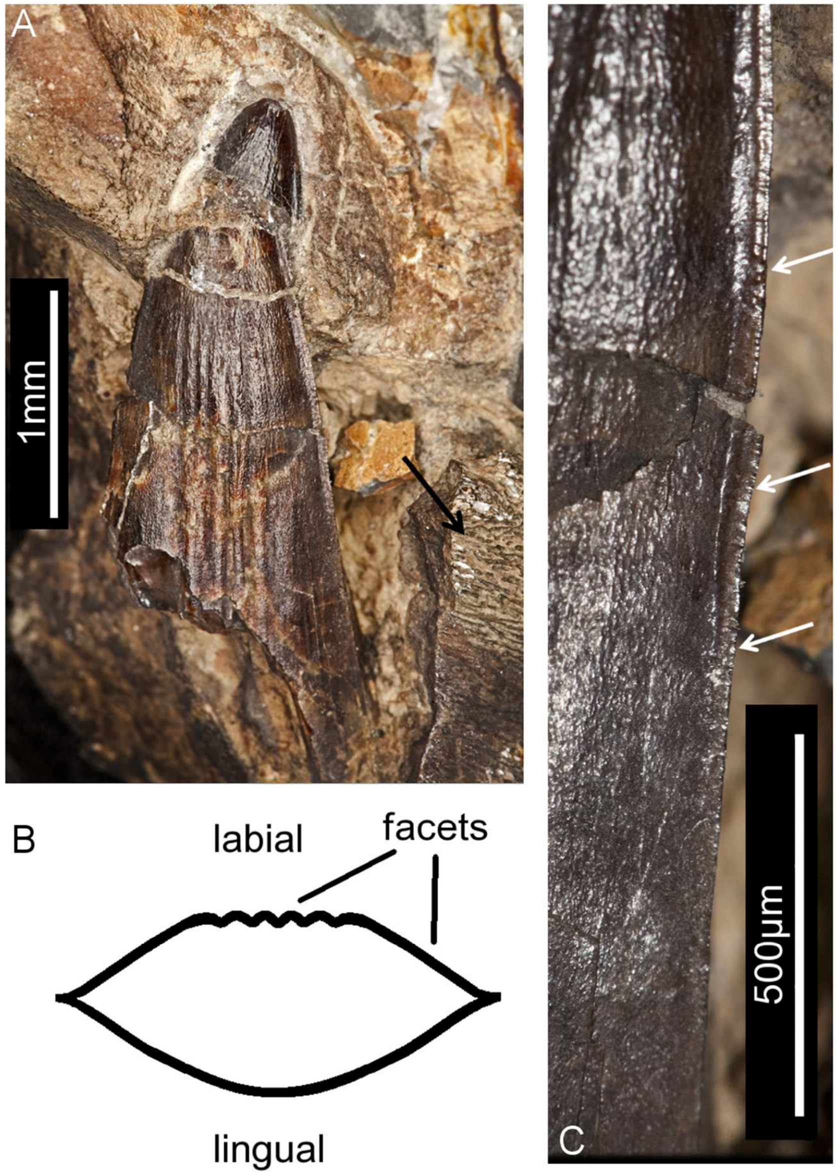

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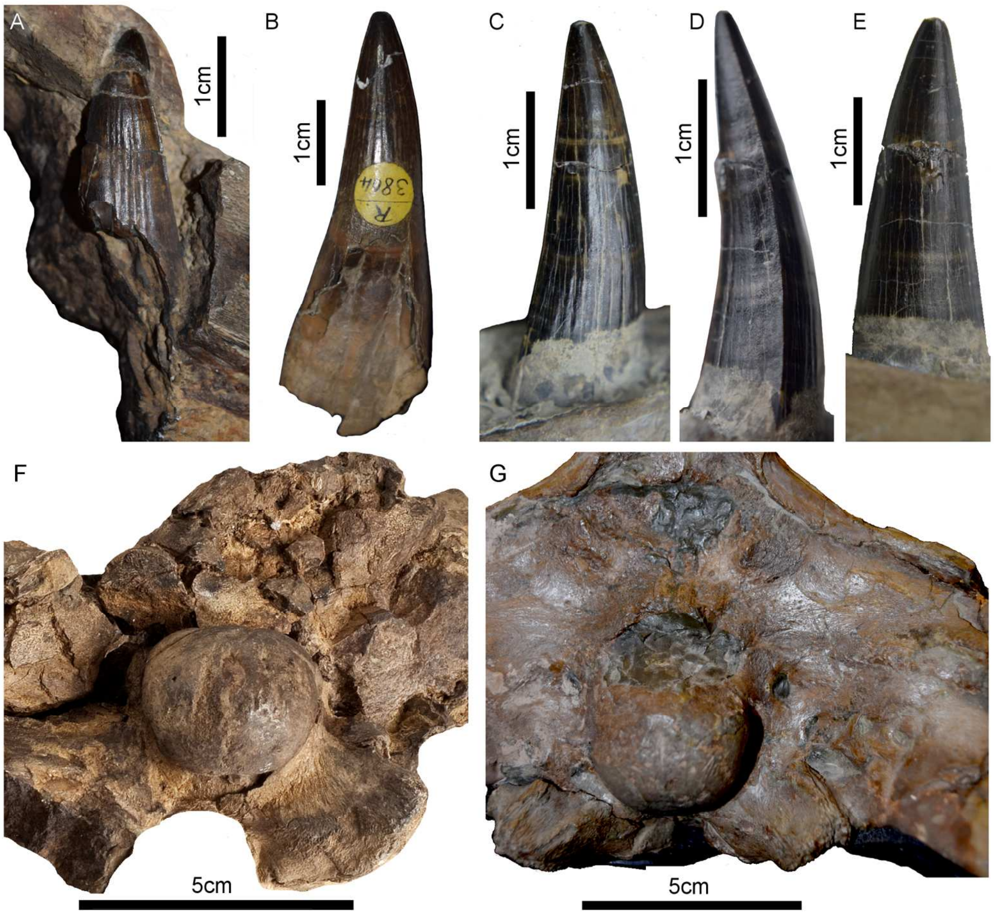

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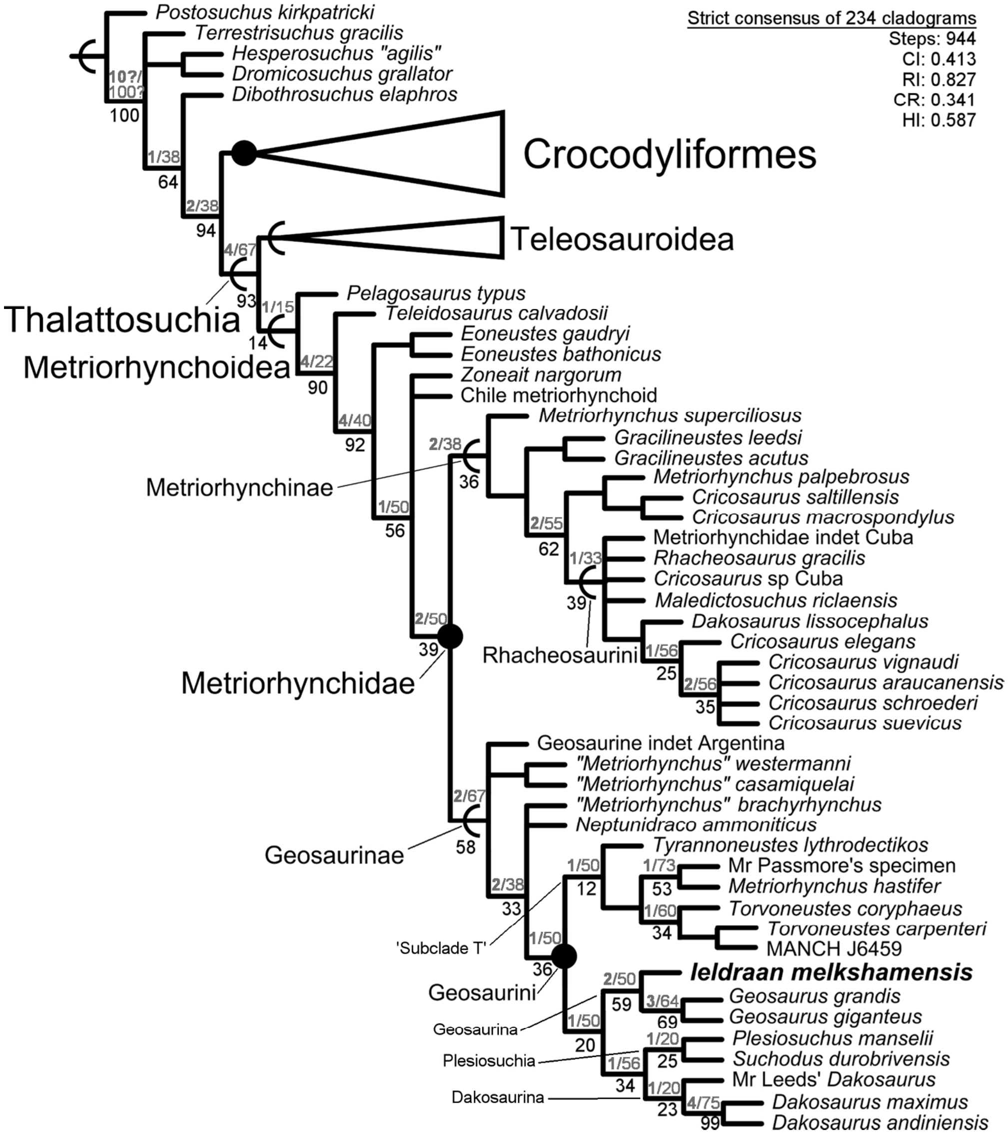

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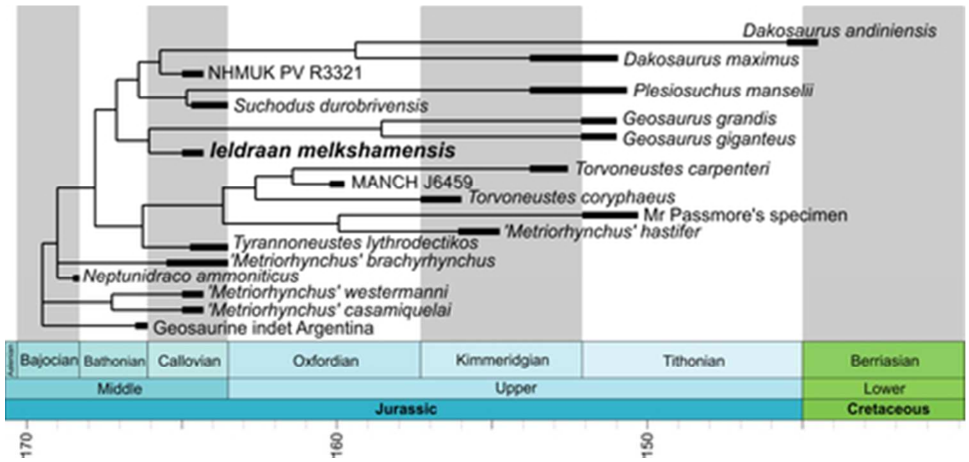

Figure 7. Time-calibrated phylogenetic tree of Geosaurinae.

40x19mm (300 x 300 DPI)

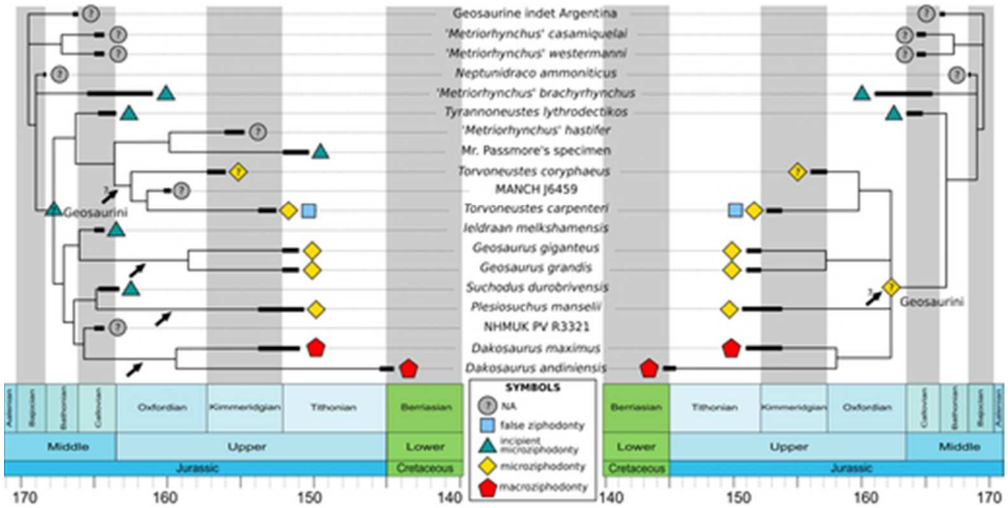

Figure 8. Time-calibrated cladograms of Geosaurinae with mapped different ziphodonty morphologies. Our tree (left) is compared to a modified version of Young (2014) and Young et al. (2013b) topology (right). Notice the how the addition of new Middle Jurassic OTUs improved resolving Geosaurini inner relationships and changed our understanding of the time and mode of ziphodonty evolution within the group. The black arrows indicate the lineages where ziphodonty was acquired.

43x22mm (300 x 300 DPI)

Table 1. Comparative tables highlighting the craniomandibular and dental differences between *'Metriorhynchus' brachyrhynchus* (PETMG R248 and NHMUK PV R 3804) and *Ieldraan melkshamensis* (NHMUK PV OR 46797).

	***'Metriorhynchus' brachyrhynchus* (PETMG R248, NHMUK PV R 3804)**	***Ieldraan melkshamensis* (NHMUK PV OR 46797)**
Skull roof ornamentation	Conspicuous made by medium sized pits and shallow to deep furrows.	Inconspicuous, numerous very small oval pits, very rare furrows.
Mandible ornamentation	Conspicuous made by medium sized pits and shallow to deep furrows.	Inconspicuous, numerous very small oval pits.
Basioccipital tuberosity size	Moderate	Greatly enlarged
Dentition	Strongly laterally compressed, unornamented on both sides. The enamel appears smooth on both sides.	Enlarged crowns, laminar, tri-facets on the labial side. Weakly ornamented by non-continuous apicobasal ridges visible on the apical half. The enamel has a rough appearance.
Carinae	Not prominent.	Very prominent especially on the apical half.
Flutings	Poorly defined, non-parallel, unequal in length, usually more than five. Not present in all present crowns.	Well defined, exclusively on the middle facet of the crowns, always three ridges and five troughs. Present in all preserved crowns.

Table 2. Ziphodonty related characters in Oxford Clay Formation and Kimmeridge Clay Formation geosaurines. The table was compiled using personal examinations of specimens, from Young *et al.* (2013b) and Young *et al.* (2016).

	Denticles				Tooth morphology		
Species	**Development***	**Shape – size**	**Denticle distribution**	**Functionally serrated edge**	**Overall Morphology**	**Mediolateral compression**	**Labial surface**
***'Metriorhynchus' brachyrhynchus* (NHMUK PV R 3804, NHMUK PV R 3700, PETMG R248)**	Poorly developed	Isomorphic – unequal in size, always <300 µm	Non-contiguous	No	Incipient microziphodonty	Weak to strong	Convex (sometimes fluted)
***Tyrannoneustes lythrodectikos* (NHMUK PV R 3939; PETMG R176)**	Incipient	Isomorphic – unequal in size, always <300 µm	Non-contiguous	No	Incipient microziphodonty	Medium to strong	Convex
***Ieldraan melkshamensis* (NHMUK PV OR 46797)**	Incipient/poorly developed	Isomorphic – unequal in size, always <300 µm	Non-contiguous	No	Incipient microziphodonty	Strong (laminar)	Tri-faceted and fluted
***Suchodus durobrivensis* (NHMUK PV R 1994, NHMUK PV R 2039)**	Poorly developed	Isomorphic – unequal in size, always <300 µm	Non-contiguous	No	Incipient microziphodonty	Weak	Convex
Mr. Leeds' Dakosaur (NHMUK PV R 3321)	Incipient/poorly developed	Isomorphic – unequal in size, always <300 µm ?	? Non-contiguous	?	? Incipient microziphodonty	Weak	Convex
Geosaurinae indet. (NHMUK PV R 486)	Well developed	Isomorphic – unequal in size, always <300 µm	Contiguous	Yes	Microziphodonty	Weak	Convex
***Torvoneustes carpenteri* (BRSMG Cd7203, BRSMG Ce17365)**	Poorly developed	Isomorphic – unequal in size, always <300 µm	Contiguous	Yes	Microziphodonty and false ziphodonty	Weak to absent	Convex
Mr. Passmore's specimen (OUMNH J1583)	Poorly developed	Isomorphic – unequal in size	Non-contiguous	No	Incipient microziphodonty	Weak to absent	Convex
***Geosaurus giganteus* (NHMUK PV OR 37020, NHMUK PV R 1229, NHMUK PV R 1230)**	Well developed	Isomorphic – equal/subequal in size, but always <300 µm	Contiguous	Yes	Microziphodonty	Strong (laminar)	Tri-faceted
***Geosaurus grandis* (BSPG AS I VI 1)**	Well developed	Isomorphic – equal/subequal in size, but always <300 µm	Contiguous	Yes	Microziphodonty	Strong (laminar)	Tri-faceted
***Plesiosuchus manselii* (NHMUK PV OR 40103; NHMUK PV R 1089; MJML K434**	Well developed	Rectangular – equal in size, but always <300 µm	Contiguous	Yes	Microziphodonty	Weak	Convex
***Dakosaurus maximus* (SMNS 82043; NHMUK PV OR 35766)**	Well developed	Isomorphic – equal in size, generally >300 µm	Contiguous	Yes	Macroziphodonty	Weak	Convex

e. estimate; *incipient: hard to discern even on SEM; poorly developed: visible with the aid of hand lens/SEM.

Online supplementary material for:

A new metriorhynchid crocodylomorph from the Oxford Clay Formation (Middle Jurassic) of England, with implications for the origin and diversification of Geosaurini

Changes to the scorings from Young *et al.* (2016)

Here the scores for 23 characters were changed from the previous version of the Young *et al.* (2016) matrix. Most of the characters we changed were previously scored as uncertain, but could be scored after DF's close examination of NHMUK PV OR 46797. The list of the score we changed, and motivations for the different score are attached discussed in details below.

I. **Character 5 is now scored as 1 instead of ?.** The ornamentation of the maxilla, is still visible in the two fragments of the left maxilla, and as it was mentioned in the description consists of numerous pits as in *Geosaurus* (see main text and figure 1).

II. **Character 22 is scored 0 instead of ?.** Despite being poorly preserved, this contact can be followed/described as irregular, and does not differ from other Metriorhynchidae, which are scored as 0 – as opposed to *Cricosaurus aracaunensis* in which this contact is a continuous smooth line with posterior-laterally directed concavity.

III. **Character 23 is scored 1 instead of ?.** If our interpretation is correct, there is clear evidence of the nasal-prefrontal contact. So, this character should be scored as 1 (contact present)

IV. **Character 26 is scored 0 instead of ?.** The posterior fragment of the left maxilla bears some small to medium size foramina just above the alveolar margins, slightly dorsal to the maximum extent of the notches.

V. **Character 44 is scored 0 instead of ?.** The posterior part of the frontal shows that the skull roof of NHMUK PV OR 46797 is complex as in other thalattosuchians, as opposed to a broad 'skull table' as shared in Crocodyliformes.

VI. **Character 49 is scored {1,2} instead of 1.** This character codes the anterior extend of the supratemporal fossa in dorsal view with respect to the frontal-postorbital suture. We showed that this suture is not visible. However, we can exclude states '0' and '3' as it is clear from the preserved frontal that the fossa is not as extended as in *Dakosaurus* (reaching the narrowest frontal point in the orbital region). As we cannot be sure of the certain position of frontal-postorbital suture we scored this character as {1,2}.

VII. **Character 51 is scored 0 instead of ?.** The preserved left supratemporal bar does clearly show a sign of a distinct angle where the lateral and anterior margin meet, instead of being a continuous curve as the derived species of *Cricosaurus*.

VIII. **Character 52 is scored 0 instead of ?.** Similar to the previous character, there is no evidence showing that the anterior and posterior margin of the supratemporal fossa are sub/parallel. They are instead similar to other metriorhynchids

IX. **Character 56 is scored 0 instead of ?.** The supratemporal arch is preserved in lateral view, which allows to distinctively assessing that its dorsal margin is concave.

X. **Character 57 is scored 2 instead of ?.** The prefrontal lateral development is very clearly visible on both sides and can be compared with the depth of the supraorbital notch. This demonstrates that the prefrontal of *Ieldraan melkshamensis* is as laterally enlarged as in all other metriorhynchids.

XI. **Character 59 is scored 1 instead of ?.** Similarly, we can clearly see the 'tear-drop' shape of the prefrontal.

XII. **Character 60 is scored 1 instead of ?.** As we described in the main text, it was possible to measure the angle of the inflexion point from the anteroposterior axis of the skull. The measure was made in dorsal view on the left prefrontal and is approximately 70 degrees.

XIII. **Character 61 is scored 0 instead of ?.** The prefrontal appears to be longer than wide.

XIV. **Character 64 is scored 0 instead of ?**. DF assessed that the anterior process of the prefrontal is preserved on both sides. Although the contact is not well preserved it is certainly not posteriorly directed 'V'-shaped.

XV. **Character 66 is scored 0 instead of ?.** The frontal is well preserved enough to clearly show that it is flat as in all Thalattosuchia.

XVI. **Character 67 is scored 0 instead of ?.** In NHMUK PV OR 46797, the frontal dorsal surface is flat (perhaps slightly convex) as opposed to concave.

XVII. **Character 69 is scored 1 instead of ?.** This character describes the angle between medial and lateral posterior process of the frontal. We measured it following the indication of figure 4 Wilkinson *et al*. (2008).

XVIII. **Character 93 is scored 0 instead of ?.** The right supraorbital notch is preserved in NHMUK PV OR 46797, although the general shape of the same area is better assessed on the left side.

XIX. **Character 129 is scored 1 instead of ?.** According to our interpretation of the occipital surface, the foramen for cranial XII nerve is below the foramen magnum.

XX. **Character 166 is scored 2 instead of ?.** The surangulodentary suture is deeply excavated as it can be clearly observed in the large preserved pieced of both the dentary and surangular.

XXI. Character 169 (Splenial % symphysis) is scored 2 instead of ?. Although the entire length of the mandible is not preserved, it is clear that NHMUK PV OR 46797 splenial is, as in *Geosaurus,* extensively involved (>20%) in the mandibular symphysis. An involvement (<10%) would result in an unprecedented and unrealistic length of the mandible. Alternatively, this may be due to a short splenial anterior process, but this should be excluded (see Description in the main text).

XXII. Character 195 is scored ? instead of 1. We changed the score of this character because we reinterpreted the tooth positions in NHMUK PV OR 46797. We cannot be anymore sure that there is a diastema in between D4-D5.

XXIII. Character 220 is scored 0 instead of ?. Microphotography photos reveals that the crowns of NHMUK PV OR 46797 are in fact ornamented (see description in the main text for further details).

List of the 298 osteological characters used in the phylogenetic analyses. All the osteological characters are the same as in Young *et al.* (2016).

Rostrum

Character	Description
1	**Skull width to length ratio:** *= maximum width between the lateral-most points of the quadrates : basicranial length* 0. 0.26 or lower 1. between 0.27 and 0.4 2. 0.4 or greater
2	**Rostrum cross-section:** 0. nearly tubular (lateromedial & dorsoventral axes subequal ±5%) 1. wider than tall (dorsoventral axis 120% or more of the lateromedial axis) 2. taller than wide (dorsvoventral axis greater than lateromedial axis)
3	**Rostrum, in dorsal view – amblygnathy ("bullet-shaped", with the rostrum retaining its width along almost all its length):** *State (1) is an apomorphy of* Dakosaurus + *NHMUK PV R 3321* 0. no 1. yes
4	**Rostrum, in dorsal view immediately in front of the orbits the rostrum narrows markedly** *In Thalattosuchia, state (1) occurs in* Aeolodon priscus *and* Teleosaurus cadomensis. *Note that in many* Steneosaurus bollensis *specimens the dorsoventral compression of the skulls exaggerates the temporal region width.* 0. no 1. yes
5	**Sculpture on external surface of rostrum (maxilla):** 0. no conspicuous ornamentation, or ornamented with an irregular pattern of ridges, rugosities and anastomosing grooves 1. conspicuous pitted (circular-to-polygonal) pattern 2. conspicuous grooved-ridged pattern 3. conspicuous pits and grooves
6	**Tooth row, premaxillary alveoli and posterior maxillary alveoli:** 0. entire upper tooth row in the same plane 1. posterior maxillary alveoli ventral to all other alveoli
7	**Incisive foramen, shape: (NEW)** *In Metriorhynchidae state (1) occurs in* Torvoneustes, *Mr Passmore's specimen* + 'M.' hastifer. *State (2) occurs in* Sphagesaurus huenei 0. subcircular 1. elongate anteroposterior oval-shape (can be as long or longer than the premaxillary alveoli, but not as mediolaterally broad) 2. cross, or diamond-shaped

8	**External nares orientation: (ORDERED)** *Turner & Pritchard (2015: ch. 6; modified from Clark, 1994: ch. 6)* 0. orientated anteriorly, or anterolaterally 1. or orientated dorsally or dorsolaterally
9	**External nares, shape in dorsal view:** *State (4) is an apomorphy of Susisuchidae* 0. subcircular (diameter in any direction does not vary by more than ± 10%) 1. oval (dorsal width >10% longer than antero-posterior length) 2. 'D-shaped', with posterior edge straight 3. spoon-shaped elongate ellipse (dorsal width <40% of anteroposterior length) 4. pear-shaped 5. external nares not exposed in dorsal view
10	**External nares, posterodorsal retraction in relation to the tooth-row:** *This character was designed to quantify the degree of posterodorsal retraction of the external nares in Metriorhynchidae. Its level relative to the tooth-row is used in this regard.* *Previous states 4-6 of this character have been removed as maxillary tooth count is too variable.* 0. at the tip of the snout, with its posterior-margin not exceeding the first premaxillary alveolus 1. at the tip of the snout, but its posterior-margin does exceed the last premaxillary alveolus 2. the posterior-margin reaches to the beginning of the 1st maxillary alveolus 3. posterodorsally displaced, anterior-margin begins posterior to the 1st premaxillary alveolus while the posterior-margin exceeds the beginning of the 1st maxillary alveolus
11	**Premaxilla, dorsal/anterodorsal projection of the anterodorsal margin (anterior to the external nares) (NEW):** *State (1) occurs in pholidosaurids, as well as extant species.* 0. present 1. absent
12	**Premaxilla, tooth row (NEW):** State (1) is *occurs in the pholidosaurids* Chalawan, Sarcosuchus, Terminonaris *and* Oceanosuchus. Elosuchus cherifiensis *has a modified version of this morphology, with the Pmx5 being directed posteriorly and the premaxilla being rounder in dorsal view. We have coded it as the same as other 'pholidosaurids'.* 0. alveoli along the anterior and lateral margins 1. in a slight semi-circle, resulting in the premaxillary alveoli being restricted to the anterior and anterolateral margins
13	**Premaxilla, when seen in lateral view (NEW):** *State (1) occurs in the 'pholidosaurids'* Chalawan, Elosuchus cherifiensis, Sarcosuchus, Terminonaris *and* Oceanosuchus. 0. the anterior and anterolateral margins are either not sub-vertical, or does not extend ventrally when compared to the rest of the premaxilla (i.e. the dentigerous margins) 1. the anterior and anterolarteral margins are slightly to fully sub-vertical and extend

	ventrally to the rest of the element.
14	**Premaxilla, proportion of total length posterior to the external nares:** 0. greater than 67% of premaxilla total length is posterior to the external nares 1. between 50-65% 2. between 36-45% 3. 28%, or less
15	**Premaxilla, posterior process:** *State (1) occurs in* Tyrannoneustes lythrodectikos, Torvoneustes, 'Metriorhynchus' hastifer *and Mr Passmore's specimen* *Note: this character is not applicable to taxa which retract their external nares* 0. short, terminates level to the fourth maxillary alveolus, or more anteriorly 1. long, terminates level to the end of the fourth maxillary alveolus, or more posteriorly
16	**Premaxilla, development of premaxillary septum:** *State (1) scores the premaxillary septum of Rhacheosaurini metriorhynchids* *It is not homologous with other crocodylomorph septa, which are either partially formed by the nasals, or do not originate on the external surface of the premaxilla immediately anterior to the nasal fossa* 0. no septum, with a single undivided nasal cavity, or a divided nasal cavity, not formed solely by a premaxillary septum 1. nasal cavity divided by a midline premaxillary septum
17	**Distance between premaxilla and nasal:** 0. none, premaxilla and nasal contact 1. small, less than half the midline length of the premaxilla 2. large, ~ 80% to more than 100% of the midline length of the premaxilla
18	**Nasal contribution to the margin of the external nares:** 0. present 1. absent
19	**Nasals, outline in dorsal view:** *State (1) is an apomorphy of both Thalattosuchia and Notosuchia.* 0. rectangular, with lateral margins mostly parallel 1. clearly triangular
20	**Nasal, lateroposterior processes:** *State (1) is an apomorphy of Metriorhynchidae* 0. absent 1. present
21	**Nasals, posterior portion at the midline:** *We changed this character from Andrade (2010: ch. 75) to the one by Nesbitt (2011: ch. 34) in order to test the homology of the metriorhynchoid and (most) teleosauroid "midline trench" and "depression" with similar depression (state 1) seen in "rauisuchians" and "sphenosuchians".* 0. lacks a midline concavity or 'midline trench' - nasals are flat or convex 1. has a concavity at the midline, or a 'midline trench'
22	**Nasal contact with the prefrontal, in dorsal view:** *State (1) is an apomorphy of the* Cricosaurus araucanensis. 0. irregular

	1. smooth curve with a concavity directed posterolaterally
23	**Nasal-prefrontal contact:** 0. Absent 1. Present
24	**Premaxilla–maxilla lateral fossa excavating alveolus of last premaxillary tooth:** 0. no 1. yes
25	**Maxilla, ventrolateral edge:** 0. straight 1. single convexity 2. double convexity ('festooned')
26	**Neurovascular foramina (posterior maxilla), distribution on the alveolar margin (NEW):** *Andrade et al. (2011: ch. 26)* *State (1) occurs in goniopholidids* 0. ventral-most foramina not high on the maxillary margin, either close or next to the alveoli 1. ventral-most foramina high on the maxilla (up to twice the distance from other foramina), very distant to the alveoli
27	**Maxilla, presence of lateral fossa/fossae next to the alveolar margin:** *Andrade et al. (2011: ch. 86)* *Paired depressions on either maxilla, which are anteroposteriorly elongated, complex and entirely supported by the maxilla.* *State (1) is an occurs in Goniopholididae. Note, that we do not consider the maxilla-jugal fossa of Pholidosauridae to be homologous.* 0. absent, maxillary bony surface convex or flat 1. present
28	**Maxilla, presence of a lateral fossa/fossae next to the jugal suture:** *State (1) occurs in Tethysuchia* 0. absent, maxillary bony surface convex or flat 1. present, with the fossa continuing on to the lateral surface of the jugal
29	**Maxilla, aligned set of large foramina extending posteroventrally from the antorbital/preorbital fossa, interconnected through a shallow groove:** *State (1) is an apomorphy of* Dakosaurus. 0. no 1. yes
30	**Maxilla-lacrimal, contact:** 0. partially included in antorbital/preorbital fossa 1. completely included
31	**Lacrimal, contact with the nasal:** 0. dorsal edge of lacrimal only 1. primarily the anterior edge of the lacrimal 2. no contact
32	**Nasal-lacrimal suture, length compared to nasal-prefrontal suture (in dorsal view):** 0. long, subequal or longer than naso-prefrontal suture

	1. short, 60% or less than naso-prefrontal suture
33	**Lacrimal, dorsal exposure:** 0. present, can be observed in both dorsal and lateral view 1. absent, only visible in lateral view (lacrimal vertically orientated)
34	**Lacrimal, size:** 0. large, in lateral view at least 45% of orbit height 1. small, less than 40% of orbit height
35	**Antorbital fenestra, size and presence:** *The absence of the antorbital fenestra (state 2) occurs independently numerous times in the evolution of Crocodylomorpha. Within Thalattosuchia, all early Jurassic taxa possess antorbital fenestrae. By the Callovian (Middle Jurassic) these fenestrae become rare.* 0. at least half the diameter of the orbit 1. much smaller than the orbit 2. absent
36	**Antorbital fenestra, bones enclosing (nasal):** *Modified as the metriorhynchid character states relating to the antorbital fenestra/fossa have been excluded. This is due to hypothesis 2 of Fernández & Herrera (2009), in which the antorbital cavity is internalised in metriorhynchids. The opening classically referred as the "*antorbital fenestra*" in this clade is in fact a neomorphic preorbital opening for the excretion of salt.* 0. nasal does not contribute to the antorbital fenestra 1. nasal does contribute to the antorbital fenestra
37	**Antorbital fenestra, bones enclosing (jugal):** *Similar to the previous character, except it codes for the jugal participation in the antorbital fenestrae rather than the nasal.* 0. jugal does not contribute to the antorbital fenestra 1. jugal does contribute to the antorbital fenestrae
38	**Antorbital fossa, shape:** *Modified as the metriorhynchid character states relating to the antorbital fenestra/fossa have been excluded. This is due to hypothesis 2 of Fernández & Herrera (2009), in which the antorbital cavity is internalised in metriorhynchids. The opening classically referred as the "*antorbital fenestra*" in this clade is in fact a neomorphic preorbital opening for the excretion of salt.* 0. subcircular or subtriangular 1. elongated
39	**Antorbital fossa, bones enclosing (nasal):** 0. nasal does not contribute to the antorbital fossa 1. nasal does contribute to the antorbital fossa
40	**Antorbital fossa, bones enclosing (jugal):** *Similar to the previous character, except it codes for the jugal participation in the antorbital fossa rather than the nasal.* 0. jugal does not contribute to the antorbital fossa 1. jugal does contribute to the antorbital fossa
41	**Preorbital fenestra (not homologous to archosaurian antorbital fenestra), presence:**

	*Herein we follow hypothesis 2 of Fernández & Herrera (2009), in which the antorbital cavity is internalised in metriorhynchids. The opening classically referred as the "*antorbital fenestra*" in this clade is in fact a neomorphic preorbital opening for the excretion of salt. This opening is connected via ducts to a chamber which housed large salt-glands (see Fernández & Herrera, 2009). This fenestra is bound by an elongate, narrow and obliquely orientated fossa bound by the lacrimal, nasal and maxilla.* 0. absent 1. present
42	**Antorbital fenestra, height:** *Character re-phrased as referring to the antorbital fenestra, and is therefore cannot be coded for metriorhynchids.* 0. approximately as tall as the height between the tooth row to the ventral rim of the fenestra (±10%) 1. less than the height between the tooth row to the ventral rim of the fenestra
43	**Prefrontal-lacrimal fossae:** *The prefrontal-lacrimal fossa (sensu Young & Andrade, 2009) refers to a shallow depression immediately anterior to the orbit, present on both the prefrontal and lacrimal. It is situated posterior to the preorbital fenestra, and never contacts the preorbital fossa. There is a crest within this fossa that is present along the prefrontal-lacrimal contact. State (1) is an apomorphy of Metriorhynchidae.* 0. absent 1. present, with ridge following the sutural contact between these elements

Skull roof

Character	Description
44	**Skull roof:** *State (1) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. complex 1. dorsally flat 'skull table' developed
45	**Posterior skull table:** *Note that* Sphagesaurus *codes differently in this character, and for the preceding character.* 0. non-planar (squamosal ventral to horizontal level of postorbital and parietal) 1. planar (postorbital, squamosal, and parietal on same horizontal plane)
46	**Cranial table width relative to ventral portion of skull:** 0. nearly as wide 1. narrower
47	**Mature skull table, with broad lateral curvature:** 0. short caudolateral process of the squamosal 1. mature skull table with nearly horizontal sides; significant caudolateral process of the squamosal
48	**Supratemporal fossa (modified from Nesbitt 2011: ch. 144):** *We changed this character from Young (2014: ch. 46) to the one by Nesbitt (2011) in order to test the homology of metriorhynchid "infratemporal flanges" and the teleosauroid anteromedial supratemporal fossae, with the anterior extension seen in*

	basal crocodylomorphs. *State (0) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. absent anterior to, and anteromedially to, the supratemporal fenestra 1. present anterior to, or anteromedially to, the supratemporal fenestra
49	**Supratemporal fossa, anterior margin in dorsal view:** *This character was designed to quantify the anterior extent of the supratemporal fossae. In Metriorhynchidae, the fossae begin to invade the dorsal surface of the orbital region. In both* Dakosaurus *and* Cricosaurus saltillensis, *and* C. schroederi*, the supratemporal fossae extend as far anteriorly as the minimum interorbital distance (state 3).* 0. anterior margin terminates posterior to the postorbital 1. anterior margin terminates between the anterior and posterior points of the frontal-postorbital suture 2. reaches terminates at least level to the postorbital anterior-margin 3. projects more anteriorly than the postorbital and reaches the interorbital minimum distance
50	**Supratemporal fossae, shape, anteroposterior and lateromedial axes:** *In Thalattosuchia, state (1) are apomorphies for* Teleosaurus cadomensis *and* Maledictosuchus ricalensis 0. longitudinal ellipsoid/sub-rectangular (anteroposterior axis more than 10% longer than the lateromedial axis) 1. sub-square/sub-circular (anteroposterior and lateromedial axes subequal, ± 5%) 2. transverse ellipsoid/sub-rectangular (lateromedial axis more than 10% longer than the anteroposterior axis)
51	**Supratemporal fossae, teardrop-shape (lateral and posterior margins of the fossae form a continuous curve, i.e. no distinct angle where the two margins meet):** *State (1) is an apomorphy of derived species of* Cricosaurus *(e.g.,* C. araucanensis, C. schroederi and C. vignaudi*)* 0. no 1. yes
52	**Supratemporal fossae, shape, parallelogram (lateral and medial margins, and anterior and posterior margins are sub-parallel):** *State (1) is an apomorphy of* Machimosaurus *and* 'Steneosaurus' obtusidens 0. no 1. yes
53	**Supratemporal fenestra, in dorsal view, size relative to orbits:** 0. longer in length than the orbit (supratemporal length 110% or more of orbit length) 1. subequal in length as the orbit (± 5%) 2. smaller than the orbits (supratemporal length less than 90% of orbit length)
54	**Supratemporal fenestra, in dorsal view, posterior limit:** *State (2) is an apomorphy of the* Dakosaurus+Plesiosuchus *sub-clade.* *Note: coding of this character can be misleading, especially in skulls that have suffered taphonomic dorsoventral compression/shearing.* 0. terminates well before the posterior-most point of the parietal

	1. either terminates near the posterior-most of the parietal or exceeds it, but never reaches the supraoccipital 2. more posterior than intertemporal bar
55	**Supratemporal arch, medial margin in dorsal view:** *State (1) is an apomorphy of* 'Dakosaurus' lissocephalus + Cricosaurus. 0. not convex 1. convex
56	**Supratemporal arch, dorsal margin in lateral view:** 0. concave 1. straight 2. convex
57	**Prefrontal, lateral development:** *The transverse development of the prefrontal is a classic characteristic of Metriorhynchidae.* *State (1) is an apomorphy of* Eoneustes. *State (2) is an apomorphy of Metriorhynchidae.* 0. reduced, flush with the rim of the orbit 1. incipient enlargement (extending laterally over the orbit by approximately 5% of its width) 2. enlarged (extending laterally over the orbit by >15% of its width)
58	**Prefrontal, lateral development relative to the posterolateral corner of the supratemporal fossa in dorsal view:** 0. Prefrontal does not expand laterally so that it is in the same plane as the posterolateral corner of the supratemporal fossa 1. Prefrontal expands further laterally than the posterolateral corner of the supratemporal fossa
59	**Prefrontal, shape in dorsal view:** *Sstate (1) is an apomorphy of Metriorhynchidae.* 0. quadrilateral with irregular outline 1. teardrop-shaped
60	**Prefrontal, morphology of the lateral border in dorsal view:** *This character describes the shape of the prefrontal in Metriorhynchidae.* Plesiosuchus*,* Geosaurus *and* Torvoneustes *code as state (1). State (2) is an apomorphy of* Dakosaurus. 0. continuous convex curve, inflexion point approximately 80-90 degree angle from the anteroposterior axis of the skull 1. continuous convex curve, inflexion point approximately 60-70 degree angle from the anteroposterior axis of the skull 2. continuous convex curve, inflexion point approximately 50 degree angle from the anteroposterior axis of the skull
61	**Prefrontal, dimensions in dorsal view:** 0. longer than wide 1. length/width is subequal (± 5%)
62	**Prefrontal, anterior to the orbits:** 0. elongate, oriented parallel to antero-posterior axis of the skull 1. short and broad

63	**Prefrontal, nasal-prefrontal suture has a pronounced, rectangular 'concavity' (directed posteriorly):** *State (1) is an apomorphy of* Eoneustes. 0. absent 1. present
64	**Prefrontal, nasal-prefrontal suture has a posteriorly directed 'V'-shape:** *State (1) is an apomorphy of* Cricosaurus macrospondylus. 0. absent 1. present
65	**Frontal, ornamented:** *In metriorhynchid, the main body of the frontal can be largely or entirely 'smooth', while the anteromedial process is ornamented. If this process is ornamented, the taxon was still coded from states (0-2).* 0. yes, with shallow to deep elliptical pits and shallow to deep grooves 1. yes, shallow to deep elliptical pits 2. yes, shallow to deep grooves 3. no
66	**Frontal, dorsal surface along the midline: (NEW)** *Modified from Nesbitt (2011: ch. 42)* *State (0) is an apomorphy of Crocodyliformes and Thalattosuchia (although there is a reversal in numerous neosuchian clades)* 0. flat 1. an incomplete longitudinal ridge along the midline 2. a longitudinal ridge that proceeds along the entire length of the midline
67	**Frontal, dorsal surface: (NEW)** *State (1) occurs in* Hesperosuchus *cf.* agilis, Dromicosuchus grallator, *and among many tethysuchians (except derived dyrosaurids)* 0. slightly convex or flat 1. concave, with the medial borders of the orbit upturned
68	**Frontal, anteromedial process: (NEW)** *State (1) is an apomorphy of Sebecia, and also occurs in some basal dyrosaurids* 0.frontal anteromedial process has an acute anterior margin, which separates the left and right nasals along their posterior margin 1. frontal anteromedial process lacks an acute anterior margin, with the nasal posterior margin with the frontal being either transversely straight, or is slightly convex or concave (in taxa where the prefrontals expand anterolaterally, there can sometimes be posteromedial processes of the nasals)
69	**Frontal, angle between medial and lateral posterior processes:** 0. approximately 90 degree angle, or obtuse 1. approximately 70-60 degree angle 2. approximately 45 degree angle, or more acute
70	**Frontal, minimum width between orbits in dorsal view compared to the supratemporal fossa:** 0. greater than the width of one supratemporal fossa and the intertemporal bar 1. subequal to width of one supratemporal fossa
71	**Frontal, minimum width between orbits in dorsal view compared to the orbits:**

	0. broader than orbital width 1. subequal with orbital width 2. narrower than orbital width
72	**Frontal-parietal, between supratemporal fossa in dorsal view (intertemporal bar):** 0. frontal and parietal subequal in width (± 5%) 1. frontal width is wider than the parietal. Can be extreme (greater than 75%)
73	**Frontal-postorbital suture:** 0. level with the intertemporal bar 1. lower than the intertemporal bar
74	**Frontal-postorbital suture, in dorsal view:** *State (1) is a metriorhynchid apomorphy.* 0. irregular and straight or gently curved 1. frontal overlaps the postorbital, creating a directed posteriorly 'V'-shape.
75	**Postorbital, shape in dorsal view:** 0. the outer margin is convex where the postorbital curves posteriorly forming the supratemporal arch 1. forming a 90 degree angle 2. anterior extension from the corner
76	**Postorbital, anterolateral extension:** *State (1) of this character, and state (2) of the character "anterior extension from the postorbital corner" do not necessary occur in the same taxon (e.g.* Oceanosuchus*).* 0. small or absent 1. very large, appearing in lateral view to contact the dorsal surface of the jugal
77	**Postorbital and squamosal, relative lengths in dorsal view:** 0. squamosal is longer 1. postorbital is longer
78	**Squamosal, projects further posteriorly than the occipital condyle:** 0. no 1. yes
79	**Squamosal, contribution to the supratemporal arch:** 0. 40% or less 1. at least 50%
80	**Squamosal dorsolateral edge, longitudinal groove (NEW):** *Nesbitt (2011: ch. 53)* *State (1) is an apomorphy of Crocodyliformes and Thalattosuchia* 0. absent 1. present
81	**Squamosal dorsolateral edge, longitudinal groove margins (NEW):** 0. ventral margin of the groove projects more laterally than the dorsal margin 1. ventral margin is directly underneath the dorsal margin
82	**Parietals, in presumed adults: (NEW)** *Nesbitt (2011: ch. 58)* 0. separate 1. interparietal suture partially or completely absent
83	**Parietals, supratemporal (= dorsotemporal) fenestrae separated by: (NEW)**

	Nesbitt (2011: ch. 59) 0. broad, flat area 1. supratemporal fossa separated by a mediolaterally thin strip of flat bone 2. supratemporal fossa separated by a ‘‘sagittal crest’’ (which may be divided by the interparietal suture)
84	**Parietal, bifurcation of the parietal in dorsal view, immediately posterior to the intertemporal bar: (NEW)** *State (1) is found in* 'Dakosaurus' lissocephalus, Cricosaurus araucanensis*,* C. elegans, C. lithographicus, C. schroederi *and* C. vignaudi. *This character replaces the character that described the posterior margin of the parietal-squamosal in dorsal view.* 0. No 1. Yes
85	**Parietals, posteroventral edge: (NEW)** *Nesbitt (2011: ch. 60)* *State (1) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. extending more than half the width of the occiput 1. less than half the width of the occiput

Orbit and temporal region

Character	Description
86	**Orbit, position:** 0. fully dorsal 1. mainly dorsal, but with slight inclination 2. lateral, but slightly inclined dorsally, usually visible in dorsal view 3. fully lateral with orbit shape only clear in lateral view
87	**Orbit, shape:** 0. circular, anteroposterior and dorsoventral axes subequal (± 5%) 1. longitudinal ellipsoid, anteroposterior axis more than 10% longer than mediolateral axis 2. transverse ellipsoid, mediolateral axis more than 10% longer than anteroposterior axis
88	**Orbit, anterodorsal margin and the lacrimal:** *In Thalattosuchia, state (1) is an apomorphy of* Teleidosaurus calvadosii 0. lacrimal is excluded from the orbit anterodorsal margin 1. lacrimal reaches the orbit anterodorsal margin
89	**Orbit, posterodorsal margin and the postorbital:** *In Thalattosuchia, state (1) is an apomorphy of the clade* Teleidosaurus + *Metriorhynchidae* 0. postorbital is excluded from the orbit posterodorsal margin 1. postorbital reaches the orbit posterodorsal margin
90	**Orbit, anteroventral margin and the lacrimal:** 0. lacrimal is excluded from the orbit anteroventral margin 1. lacrimal reaches the orbit anteroventral margin
91	**Orbit, posteroventral margin and the postorbital:**

	*In Thalattosuchia, state (1) occurs in basal teleosaurids (*Steneosaurus brevior, S. bollensis, Peipehsuchus teleorhinus, Platysuchus multiscrobiculatus & Teleosaurus cadomensis) 0. postorbital is excluded from the orbit posteroventral margin 1. postorbital reaches the orbit posteroventral margin (with the postorbital overlapping the jugal)
92	**Orbit, ventral margin and the jugal:** *In Thalattosuchia, state (1) is an apomorphy of* Platysuchus multiscrobiculatus 0. jugal participates in the orbit ventral margin 1. jugal excluded from the orbit by lacrimal-postorbital contact
93	**Supraorbital notch in dorsal view, deeply excavated creating an approximately semi-circular shape, resulting in the frontal being broadly exposed along the lateral margin of the orbits: (NEW)** *This character is not applicable in non-metriorhynchids.* *State (1) is an apomorphy of a subclade within Rhacheosaurini* 0. No 1. Yes
94	**Supraorbital notch in dorsal view, very small, being a tight "U"-shape, created by the prefrontal being expanded posteriorly. This results in the prefrontal making a larger contribution to the orbit dorsal margin and the frontal contribution to the orbit dorsal margin is greatly reduced, and in some taxa being excluded from the centre of the orbital dorsal margin: (NEW)** *This character is not applicable in non-metriorhynchids.* *State (1) is found in* Geosaurus*,* Metriorhynchus palpebrosus*,* Cricosaurus saltillensis *and* C. macrospondylus. 0. No 1. Yes
95	**Palpebrals:** 0. two palpebrals in orbit 1. one large palpebral 2. absent
96	**Sclerotic ossicles (composing the sclerotic ring):** *Within Thalattosuchia, state (1) is an apomorphy of* Pelagosaurus + *Metriorhynchidae.* 0. absent 1. present
97	**Jugal, width of anterior process relative to posterior process:** 0. subequal 1. about twice as broad
98	**Jugal, extends anteriorly in front of the prefrontal:** 0. no 1. yes
99	**Jugal, base of postorbital process in lateral view:** 0. directed posterodorsally 1. dorsally
100	**Postfrontal:**

	State (1) is an apomorphy of Crocodylomorpha 0. Present 1. Absent
101	**Postorbital bar, morphology of dorsal end:** 0. dorsal end of the postorbital bar broadens dorsally, continuous with dorsal part of the postorbital 1. dorsal part of the postorbital bar constricted, distinct from the dorsal part of the postorbital
102	**Postorbital bar, vascular opening on lateral edge of dorsal part:** 0. absent 1. present
103	**Postorbital bar, morphology of postorbital-jugal contact:** 0. postorbital medial to jugal 1. postorbital lateral to jugal
104	**Postorbital bar, cross-section:** *Clark (1994: ch. 26)* 0. transversely flattened 1. cylindrical
105	**Quadratojugal-postorbital, contact: (NEW)** *Nesbitt (2011: ch. 64)* *State (1) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. absent 1. present
106	**Infratemporal fenestra (=laterotemporal fenestra), in lateral view:** 0. considerably longer in length than the orbit (greater than 25%) 1. equal/subequal in length than the orbit (± 10%) 2. shorter in length than the orbit (less than 25%)
107	**Spina quadratojugalis:** 0. absent 1. either small or low crest 2. prominent

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90 **Palate and perichoanal structures**

Character	Description
108	**Palatal surface of the rostrum, notch near premaxilla-maxilla suture:** 0. absent 1. present, lozenge-shaped
109	**Palatal surface of the rostrum, naso-oral fossa:** 0. absent 1. present, usually round or elliptic in shape
110	**Maxilla-palatine contact along the palatal surface, presence:** *Character helps to quantify the development of the secondary palate.* 0. Absent 1. Present
111	**Palatine, how far anteriorly the palatine extents relative to the maxillary tooth row (more states added):**

	State (5) is an apomorphy of Plesiosuchus manselii 0. Palatine anterior margin terminates level to 20th maxillary alveoli, or more distal alveoli 1. Palatine anterior margin terminates level to 15th to 19th maxillary alveoli 2. Palatine anterior margin terminates level to 11th to 14th eleventh maxillary alveoli 3. Palatine anterior margin terminates level to the 8th to 10th maxillary alveoli 4. Palatine anterior margin terminates level to the 5th to 7th maxillary alveoli 5. Palatine anterior margin terminates level to the 4th maxillary alveoli, or more mesial alveoli
112	**Palatine, anterior margin has a mid-line anterior process:** 0. present 1. absent
113	**Palatine, mid-line anterior process shape, in palatal view:** 0. lateral margins of the mid-line anterior process converge: anteriorly orientated "V"-shape 1. lateral margins of the mid-line anterior process largely parallel: anteriorly orientated "U"-shape
114	**Palatine, anterior margin has two non-midline anterior processes:** *In Thalattosuchia, state (1) is an apomorphy of Metriorhynchinae.* *In* Montealtosuchus *and* Hamadasuchus *the mid-line anterior process has a concave anterior margin, creating two "non-midline" processes* 0. Absent 1. Present
115	**Palatine, has a very large mid-line anterior process and at the suborbital fenestrae the palatine anterior margin curves rostrolaterally towards it, creating two "small processes":** *This morphology is variably observed in Eusuchia, Dyrosauridae and Pholidosauridae.* 0. no 1. yes
116	**Palatine, form secondary palate:** *Character helps to quantify the development of the secondary palate.* 0. palatines of primary palate exposed and do not contact one another secondarily on mid-line 1. palatines meet on mid-line forming a secondary palate
117	**Pterygoid, secondary palate:** *State (2) is an apomorphy of Eusuchia and* Mahajangasuchus. 0. absent 1. thin shelves not meeting 2. present (i.e., completely encloses the choana)
118	**Palatine-pterygoid suture, lateral protrusions by palatine into the pterygoids:** 0. absent 1. present
119	**Pterygoid flange, orientation (in palatal view):** 0. horizontal 1. largely horizontal, but with a distinct anterior orientation

	2. strongly orientated posteriorly
120	**Pterygoid, delimits the posterior margin of the choanae:** 0. no, or not well-delimits the posterior margin of the choane 1. yes
121	**Choanal opening, in palatal view:** *State (1) is observed in extant species* 0. choanal opening orientated posteriorly, enclosed ventrally by the palatine and by the pterygoid dorsally 1. choana opens into palate through a deep midline depression (choanal groove)
122	**Choana, anterior margin shape:** 0. semicircular or elliptical 1. 'V'-shaped with its base directed anteriorly 2. broad 'U'-shaped with its base directed anteriorly 3. 'W'-shaped with its base directed anteriorly

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92 **Occiptial**

Character	Description
123	**Supraoccipital, posterior surface (NEW):** 0. nearly flat 1. two lateral prominences
124	**Supraoccipital, contribution to the border of the foramen magnum:** *Gower (2002: ch. 19)* 0. excluded from dorsal border of foramen magnum by mediodorsal midline contact between opposite exoccipitals 1. contributes to border of foramen magnum
125	**Paroccipital processes of the opisthotic, orientation in occipital view:** *State (1) is an apomorphy of Rhacheosaurina.* *State (2) is an apomorphy of Geosaurinae.* *State (3) is an apomorphy of Dyrosauridae and* 'Dakosaurus' lissocephalus 0. horizontal 1. dorsolaterally orientated, at a 45 degree angle 2. ventral-edge horizontal, then terminal third sharply inclined dorsolaterally at a 45 degree angle 3. ventrally arched
126	**Paroccipital processes of the opisthotic, large ventrolateral region:** 0. present 1. absent
127	**Paroccipital process, overlap by the squamosal:** 0. small: the squamosal does not extend more posteriorly than the paroccipital process 1. large: it extends further posteriorly than the paroccipital process
128	**Paroccipital processes of the opisthotic, ventral/anteroventral margin of the distal end has a sutural contact with the quadrate: (NEW)** 0. no 1. yes
129	**Foramen for cranial XII nerve, position on occipit:**

	0. above the occipital condyle in line with the foramen magnum 1. below the foramen magnum
130	**Foramen for the internal carotid artery, size:** *State (1) is an apomorphy of* Pelagosaurus + *Metriorhynchidae.* 0. similar in size to the openings for cranial nerves IX-XI 1. extremely enlarged
131	**Occipital surface ventral to occipital condyle:** *State (1) is an apomorphy of Crocodylia.* 0. slopes anteroventrally 1. roughly parallel to the transverse plane

Braincase, basicranium and suspensorium

Character	Description
132	**Trigeminal fossa (=fossa for cranial nerve V), development on quadrate and laterosphenoid:** *Character based the discovery by Fernández et al. (2011).* *State (1) is an apomorphy of Metriorhynchidae.* 0. developed rostrally and caudally to the trigeminal fenestra (i.e. fossa present on both laterosphenoid and quadrate) 1. fossa is mainly developed caudally to the fenestra (i.e. fossa present on quadrate)
133	**Supratemporal fossae, has a large pseudotemporalis fossa on its posterodorsal surface of the laterosphenoid (subfenestral position) (REVISED Character):** *Character based upon data from Holliday & Witmer (2009) and Fernández et al. (2011).* *State (1) is an apomorphy of Neosuchia.* 0. no 1. yes
134	**Parasphenoid ridge/rostrum (?), in palatal view:** *The homology of this ridge is unknown. Andrews (1913) considered the midline pterygoid ridge to be the parasphenoid. However, the pterygoids are poorly known for metriorhynchids, and we cannot discount this as a purely pteryoid structure. Until this structure has undergone CT scanning we will provisionally use the term parasphenoid for this structure.* 0. not visible 1. forms a midline ridge along the pterygoids
135	**Basisphenoid, paired ridges located medially on the ventral surface:** 0. absent 1. present
136	**Basisphenoid, exposure in palatal view:** 0. exposed on ventral surface of braincase 1. virtually excluded from ventral surface by pterygoid and basioccipital
137	**Basisphenoid, exposure anterior to the quadrates in palatal view:** *State (1) is an apomorphy of a subgroup of "teleosaurids". This character state is caused by the caudal expansion of the pterygoid's posterior margin, so that the anterior portion of the quadrates is obscured, as are the lateral margins of the basisphenoid. However, there is a distinct basisphenoid 'rostrum' that in some taxa*

	continue to bifurcate the ptergoids anteriorly. This morphology is not observed in Teleosaurus cadomensis*,* Peipehsuchus teleorhinus, Steneosaurus brevior, Pelagosaurus typus *or Metriorhynchidae.* 0. basisphenoid terminates approximately level to the anterior extent of the quadrates 1. basisphenoid 'rostrum' exposed along the palatal surface anterior to the quadrates, continuing to bifurcating the pterygoids
138	**Basisphenoid, exposure ventral to the basioccipital at maturity in occipital aspect:** *State (1) is an apomorphy of Eusuchia.* 0. absent, pterygoid dorsoventrally short ventral to median eustachian 1. present, pterygoid dorsoventrally tall ventral to median eustachian opening
139	**Basioccipial tuberosities (= basal tubera):** 0. reduced 1. large and pendulous
140	**Quadrate, prominent crest on dorsal surface of distal quadrate extending proximally to lateral extent of quadrate–exoccipital contact:** 0. absent 1. present
141	**Quadrate, contact with the proötics: (NEW)** *Nesbitt (2011: ch. 76)* *State (1) is an apomorphy of Crocodylomorpha* 0. does not contact the proötic 1. contacts the proötic
142	**Quadrate, dorsal head contact:** *State (1) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. squamosal and exoccipital/opisthotic/otoccipital (can have medial contact with proötics and laterosphenoids) 1. proötic and laterosphenoid
143	**Quadrate, dorsal head contact:** *Nesbitt (2011: ch. 77)* *State (1) is an apomorphy of Neosuchia* 0. does not have a sutural contact with the paroccipital process of the opisthotic 1. has a sutural contact with the paroccipital process of the opisthotic
144	**Quadrate orbital process, remains free of bony attachment along its anteromedial surface:** *This character represents the 'quadrate incompletely sutured to the braincase' statement in Holliday & Witmer (2009) and Fernández et al. (2011).* *State (1) is an apomorphy of Crocodyliformes (i.e. not including Thalattosuchia)* 0. yes 1. no
145	**Quadrate, fenestrae on the dorsal surface on the proximal end:** 0. two or more 1. none
146	**Quadrate, pneumatism:** 0. not pneumatic 1. pneumatic

147	**Quadrate, distal articular surface separated into two condyles: (Character can be coded if the articular is preserved and no ridge that supports the intercondylar sulcus is present)** *State (1) is an apomorphy of* Plesiosuchus 0. yes 1. no
148	**Mandibular condyle of quadrate, position:** *State (1) occurs in Neosuchia, with a reversal in Dyrosauridae* *Wu et al. (2001: ch. 124)* 0. ventral to occipital condyle 1. or on level with occipital condyle
149	**External auditory meatus fossa, anterior extension:** 0. limited to the squamosal 1. reaches the posterior margin of postorbital 2. broadly exposed on the postorbital (covering the anterolateral margin) 3. crosses the postorbital and reaches the orbit
150	**Quadrate, squamosal, and otoccipital:** 0. do not meet to enclose cranioquadrate passage 1. enclose passage near lateral edge of skull 2. meet broadly lateral to the passage
151	**Cranioquadrate canal:** *Character based on data from Jouve (2009).* 0. Incompletely separated from the external auditory aperature by a thin ventral lamina of the exoccipital not closed dorsally 1. Cranioquadrate canal clearly separated from the otic aperature by the quadrate or exoccipital and squamosal
152	**Eustachian tubes:** *Character 121 from Nesbitt (2011); based on character 13 of Gower (2002).* 0. not enclosed by bone 1. partially enclosed by bone 2. fully enclosed by bone

Mandible

Character	Description
153	**Mandible geometry, relative positions of the dentary tooth-row and coronid process, and development of dorsal curvature of the caudal-end of the mandible:** *State (1) is an apomorphy of Metriorhynchidae. Quantifies the incipient increase of gape at the base of Metriorhynchidae.* 0. gentle curvature in the dorsal margin of the mandible, from the coronoid process to the end of the tooth-row 1. strong curvature, raising the coronoid process considerably above the tooth-row
154	**Mandible geometry, relative positions of coronoid process, retroarticular process and glenoid fossa:** *State (1) is an apomorphy of the clade Geosaurini. This character quantifies the greater increase in gape associated with macrophagous geosaurines.*

	0. coronoid process level to both the retroarticular process and glenoid fossa 1. coronoid process ventral to both the retroarticular process and glenoid fossa
155	**Anterior of mandible (dentary), dorsal margin of the anterior portion compared to the dorsal margin of the posterior portion:** *Nesbitt (2011: ch. 154)* 0. horizontal (in the same plane) 1. ventrally deflected 2. dorsally expanded
156	**Anterior of mandible (dentary), in dorsal view:** *State (1) is an apomorphy of Teleosauridae (although it also appears in pholidosaurids, some dyrosaurids, and is present in some longirostrine eusuchians).* 0. Outer margin converging towards tip or parallel 1. distinct notched spatulate shape
157	**Anterior of mandible (dentary), in dorsal view (NEW):** *State (1) occurs in basal dyrosaurids and tomistomine crocodyloids.* *Note this character is not considered homologous to the 'trowel'-shape seen in* Baurusuchus, Hamadasuchus *and Peirosauridae due to their symphyseal region being shorter, broader and deeper; the tapering anterior maximal anterior width is more pronounced, and the width at the posterior symphyseal region is greater than the maximal anterior width.* 0. non 'gladius'-shaped 1. 'gladius'-shaped - i.e. a long symphyseal region with the anterior maximal width near the D3-D5 region, with the dentaries tapering anteriorly. Immediately posterior to the maximal width the dentaries begin to narrow until they reach a minimal width, and begin expanding again. At the end of the symphyseal region the breadth is now wider than the anterior maximal width.
158	**Anterior of mandible (dentary), in dorsal view (NEW):** *State (1) occurs in* Hamadasuchus, *Peirosauridae and* Baurusuchus. *Note this character is not considered homologous to the 'gladius'-shape seen in basal dyrosaurids and tomistomine crocodyloids due to their either short and broad symphyseal regions, and/or the anterior maximal width is wider or as wide as the posterior symphyseal width.* 0. non 'trowel'-shaped 1. 'trowel'-shaped - i.e. a moderate to short symphyseal region with the anterior maximal width near the D3-D5 region, with the dentaries tapering strongly anteriorly. Immediately posterior to the maximal width the dentaries begin to narrow until they reach a minimal width, and begin expanding again. At the end of the symphyseal region the breadth is either narrower or subequal to the anterior maximal width.
159	**Mandibular symphysis, length:** 0. symphysis less than a third of mandible length (lower than 0.3) 1. symphysis less than half and more than a third of mandible length (between 0.3 and 0.45) 2. symphysis under half of mandible length (between 0.45 and 0.5) 3. symphysis greater than half of mandible length (more than 0.5)
160	**Mandibular symphysis, depth:**

	This character quantifying the relative depth of the mandibular symphysis makes the absolute tooth crown size character redundant. This is because the metriorhynchids with the largest crowns also have the deepest symphyses (e.g., Dakosaurus andiniensis*,* Plesiosuchus manselii*).* 0. deep (9% or more of mandible length) 1. moderate (between 6.5-8% of mandible length) 2. narrow (between 4.5-6% of mandible length) 3. very narrow (4% or less of mandible length)
161	**External mandibular fenestra:** *State (1) occurs in Metriorhynchidae, Hylaeochampsidae and* Goniopholis *sensu stricto (Andrade et al., 2011)* 0. present 1. absent
162	**Dentary, ventral margin is distinctly curved (convex). It rises sharply dorsally towards the anterior tip (this curvature occurs along the anterior ventral margin of the dentary): (NEW)** *State (1) occurs in* Dakosaurus, Baurusuchus, *and in 'trematochampsids' and peirosaurids.* 0. no 1. yes
163	**Dentary, ventral margin is curved (concave). It rises dorsally towards the anterior tip (this curvature occurs along the anterior ventral margin of the dentary, from a dorsoventrally deepened region of the dentary, immediately anterior to the dentary-splenial suture): (NEW)** *State (1) occurs in Hylaeochampsidae.* 0. no 1. yes
164	**Dentary foramina, lateral and dorsal surface of the anterior (symphyseal) region of the dentary: (NEW)** *State (1) is an apomorphy of* Dakosaurus 0. foramina either small or variable in size. Number is variable. 1. has numerous small to medium-sized foramina
165	**Dentary tooth-row, distinctly sigmoidal: (NEW)** *State (1) is an apomorphy of Hylaeochampsidae* 0. no 1. yes, with the anterior alveoli orientated slightly anterolaterally and the posterior alveoli orientated posteromedially, between these two orientations the mid-region alveoli become dorsally orientated
166	**Surangulodentary groove, morphology:** *Note taphonomic or preservational damage can obscure state (1).* *State (2) is an apomorphy of the clade Geosaurini. Previously it was considered an apomorphy of* Dakosaurus*; however, the type specimens for the genera* Dakosaurus, Plesiosuchus *and* Geosaurus *exhibit this morphology. The deep groove is also observed in a* Torvoneustes *specimen held in a private collection. The large specimens of* Tyrannoneustes lythrodectikos *also have a deep groove.* 0. absent

	1. present as a subtle, shallow groove 2. deeply excavated
167	**Surangulodentary groove, extant:** 0. groove is longer on the dentary than on the surangular 1. groove is as long on the dentary as on the surangular
168	**Surangulodentary groove, large foramen present at the dentary terminus:** *State (1) is an apomorphy of* Dakosaurus. 0. absent 1. present
169	**Splenial, involvement in mandibular symphysis:** 0. slight (<10% of symphysis length) 1. extensive (>20% of symphysis length) 2. not involved
170	**Angular, in lateral view, length relative to the anterior margin of the orbit:** 0. angular does not extend rostrally beyond the orbits 1. angular does extend anteriorly beyond the orbits
171	**Surangular, in lateral view, length relative to the anterior margin of the orbit:** 0. surangular does not extend rostrally beyond the orbits 1. surangular does extend anteriorly beyond the orbits
172	**Surangular, along the dorsal margin of the mandible:** *This character does not always covary with the character 120, as in non-Rhacheosaurini metriorhynchines the dentary extensively overlaps the surangular (particularly in lateral view), obscuring its rostral development. The full extent of the surangular rostral development can only be determined by examining the dorsal margin in those taxa (e.g.,* Metriorhynchus*).* 0. does not extend beyond the orbit 1. does extend beyond the orbit
173	**Surangular, presence a distinct coronoid process:** *In Thalattosuchia it appears as though all taxa have a coronoid process. In teleosaurids the coronoid process is medially orientated and is not visible in lateral view, unlike in* Pelagosaurus + *Metriorhynchidae* 0. no 1. yes
174	**Surangular, extension toward posterior end of retroarticular process:** 0. along entire length 1. pinched off anterior to posterior tip
175	**Prearticular:** 0. present 1. absent
176	**Coronoid, rostral development along the dorsal margin:** 0. does not project as far as the dentary tooth row 1. projects further anteriorly than the caudal-most alveoli
177	**Coronoid, participates on the external face of the mandible:** 0. no 1. yes
178	**Articular, glenoid fossa orientation:**

	0. anterodorsally 1. dorsally
179	**Retroarticular process, shape in dorsal view:** 0. broad and robust 1. triangular 2. paddle-shaped 3. ellipsoid, spoon-shaped
180	**Retroarticular process, width:** 0. narrower than the glenoid fossa 1. wider than the glenoid fossa (projecting medially past the glenoid fossa)
181	**Retroarticular process, length:** 0. long (longer than wide, and longer than the glenoid fossa width) 1. short (wider than long, and shorter than the glenoid fossa width)

Dentition and alveolar morphologies

Character	Description
182	**Premaxilla, alveolar count:** 0. five alveoli 1. four alveoli 2. three alveoli (or fewer)
183	**Maxilla, alveolar count:** 0. 11 or fewer alveoli 1. 12-16 alveoli 2. 17-20 alveoli 3. 21-28 alveoli 4. 29 or more alveoli
184	**Number of teeth partially supported by both the premaxilla and maxilla:** *In Thalattosuchia, State (1) occurs in* Tyrannoneustes lythrodectikos, Torvoneustes, 'Metriorhynchus' hastifer *and Mr Passmore's specimen* 0. none 1. one
185	**Dentary, alveolar count:** *This character does not covary with the count of the maxillary teeth, as some taxa (e.g.* "Metriorhynchus" casamiquelai*) have more teeth in the dentary than in the maxilla* 0. 30 or more alveoli per rami 1. 20-29 alveoli 2. 19-15 alveoli 3. 14 or fewer alveoli
186	**Maxillary anterior alveoli shape: (NEW)** *In Thalattosuchia, State (1) is an apomorphy of the clade* 'Metriorhynchus' hastifer *and Mr Passmore's specimen. Note that shearing or crushing of the snout can make this character hard to discern.* 0. sub-circular 1. sub-oval, being wider transversely than anteroposteriorly
187	**Maxillary interalveolar spaces, relative size:**

	State (1) is an apomorphy of Dakosaurus + Plesiosuchus *sub-clade and* Gracilineustes leedsi *This character currently correlates with the dentary interalveolar space character* *State (1) does not occur in* Torvoneustes carpenteri, 'Metriorhynchus' hastifer *and Mr Passmore's specimen as some interalveolar spaces are large, over half the length of the adjacent alveoli and they do not alway share the same alveolar lamina. They appear to evolve an analogous, but slightly different morphology, which has not yet been coded for.* 0. Interalveolar spaces are variable in size, some are similar in length to the adjacent alveoli, while others are approximately half the length of the immediately adjacent alveoli (especially towards the end of the maxillary tooth row) 1. Interalveolar spaces are/almost completely uniformly narrow, being approximately one quarter the length of the immediate alveoli (or even smaller). The adjacent alveoli share the same alveolar lamina.
188	**Dentary alveoli one, orientation: (NEW)** *State (1) occurs in Tethysuchia (e.g. dyrosaurids,* Sarcosuchus, Chalawan) and Hamadasuchus *State (2) is an apomorphy of Hylaeochampsidae,* Dakosaurus *and* Maledictosuchus riclaensis *This morphology differs from the procumbency of the first dentary alveolus seen in Cricosaurus aracuanensis, as they are also partially laterally orientated* 0. dorsally orientated 1. mainly dorsally orientated, but with a slight anterior orientation 2. strongly anteriorly orientated (procumbent), resulting in the first dentary tooth being directed anteriorly from the mouth, along anteroposterior axis of the skull
189	**Dentary interalveolar spaces, relative size:** *State (1) is an apomorphy of* Dakosaurus+Plesiosuchus *sub-clade and* Gracilineustes leedsi *This character currently correlates with the maxillary interalveolar space character* 0. Interalveolar spaces are variable in size, some are similar in length to the adjacent alveoli, while others are approximately half the length of the immediately adjacent alveoli 1. Interalveolar spaces are/almost completely uniformly narrow, being approximately one quarter the length of the immediate alveoli (or even smaller)
190	**Dentary alveoli, diastema between the first and second alveoli: (NEW)** *State (1) is an apomorphy of* Dakosaurus maximus 0. Absent 1. Present
191	**Dentary alveoli 1–2, confluence (NEW):** *Andrade et al. (2011: 402).* *State (1) is an apomorphy of Goniopholis* 0. well-separated, usually as much distant from each other as from other dentary teeth 1. alveoli 1–2 confluent, separated by a thin alveolar wall, and clearly apart from neighbouring alveoli
192	**D2 alveoli, size relative to D1 alveoli:**

	Modified from: Hastings et al. (2010: ch. 64). 0. similar in size 1. reduced in size relative to both adjacent alveoli
193	**Interalveolar space between the D2 and D3 alveoli relative to that of the D1 and D2 alveoli:** *Modified from: Hastings et al. (2010: ch. 65).* 0. approximately equal in proportion 1. the D2–D3 interalveolar space is longer than the interalveolar space between the D1 and D2
194	**D4 alveolar wall:** *Modified from: Hastings et al. (2010: ch. 68).* 0. level with the adjacent alveoli 1. raised relative to the adjacent alveoli
195	**Dentary alveoli, diastema present between the fourth and fifth alveoli:** *State (1) is an apomorphy of Thalattosuchia* *Within Thalattosuchia: state (0) is an apomorphy of the* Dakosaurus+Plesiosuchus *sub-clade* *Note that while the very small dentary interalveolar spaces are apomorphies of* Dakosaurus, Plesiosuchus *and* Gracilineustes leedsi*, the D4-D5 diastema is still present in* Gracilineustes leedsi 0. Absent 1. Present
196	**D7 alveoli, size:** *Modified from: Jouve (2004: ch. 153), Jouve (2005: ch. 3), Jouve et al. (2005b: ch. 8), Jouve et al. (2006: ch. 164), Jouve et al. (2008: ch. 8), Hastings et al. (2010: ch. 73).* *State (1) occurs in Dyrosauridae* 0. comparable in size to the adjacent alveoli 1. reduced in size compared to the adjacent alveoli
197	**D7 alveoli, position:** *Modified from: Jouve (2004: ch. 153), Jouve (2005: ch. 3), Jouve et al. (2005b: ch. 8), Jouve et al. (2006: ch. 164), Jouve et al. (2008: ch. 8), Hastings et al. (2010: ch. 73).* *State (1) occurs in Dyrosauridae* 0. comparable in size to the adjacent alveoli 1. close in position to the eighth alveoli
198	**Dentary alveoli, number of alveoli adjacent to the mandibular symphysis:** *Within Thalattosuchia: state (3) is an apomorphy of* Dakosaurus 0. 15 or more 1. 10 to 14 2. 7 to 9 3. 4 to 6 4. Fewer than 4
199	**Premaxilla-anterior maxillary tooth crown apicobasal length to basal width ratio:** 0. 3 or greater

	1. 2.5 or less
200	**Maxillary teeth, crown size:** *Although this character would obviously correlate with the character quantifying mandibular symphysis depth, in Geosaurinae this is not necessarily the case. As shown by Young et al. (in press), the symphysis is deeper in* "Metriorhynchus" brachyrhynchus *than* Tyrannoneustes lythrodectikos*, but the latter has tooth crowns with a greater apicobasal length.* 0. crowns not enlarged (typically less than 3cm in apicobasal length) 1. moderately enlarged (between 3 and 4 cm in apicobasal length) 2. enlarged (apicobasal length 5 cm or greater)
201	**Maxillary teeth, mediolateral compression/crown cross section:** 0. no mediolateral compression 1. weak mediolateral compression (crown midpoint labiolingual width 60-90% distal-medial width) 2. strong mediolateral compression (crown midpoint labiolingual width <60% distal-medial width)
202	**Maxillary teeth, crown cross section:** 0. subcircular to elliptical 1. teardrop shaped
203	**Maxillary teeth, constriction at base of crown:** 0. absent 1. present
204	**Maxillary teeth, orientation of the anterior to mid-snout crowns:** 0. not procumbent 1. procumbent
205	**Maxillary teeth, enamel bands (sensu Brusatte *et al.*, 2007):** *Posterior-most maxillary crowns* 0. absent 1. present
206	**Maxillary teeth, tooth crown tip:** *Anterior crowns* 0. sharpen or worn apex 1. blunt and rounded at the tips
207	**Dentary teeth posterior to tooth opposite premaxilla-maxilla contact:** 0. equal in size 1. enlarged dentary teeth opposite to smaller teeth in maxillary tooth row
208	**Teeth facets:** *State (1) is an apomorphy of* Geosaurus giganteus, G. grandis *and the Melksham monster.* 0. either lacking, or faceted into 4-5 indistinct planes 1. distinctly faceted into 3 planes
209	**Laminar teeth (teeth with cross-section highly elliptical at base of crown, with mesial-distal axis approximately twice the labial-lingual axis, or greater):** *State (1) is an apomorphy of* Geosaurus *and the Melksham monster.* 0. absent 1. present, laminar teeth dominate dentition

210	**Sphagesauriform teeth (teeth with short triangular crowns covered by a relatively thick enamel layer, with a denticulate keel and thick, high-relief apicobasal enamel ridges, = longitudinal striae) in both the maxillae and dentaries: (NEW)** *State (1) is an apomorphy of Sphagesauridae.* 0. absent 1. present
211	**Tooth wear, macroscopic wear along the carinae/mesiodistal margins (NEW):** *State (1) is an apomorphy of* Dakosaurus *and closely related taxa* 0. absent 1. present
212	**Tooth curvature:** 0. none, crown apical/subapical (91 – 89 degrees) 1. weakly recurved (88 – 82 degrees) 2. strongly recurved (< 80 degrees)
213	**Tooth mesial and distal margins, presence of carinae: (character made binary)** 0. lack carinae 1. carinated – created by a smooth keel (raised ridge) on the mesial or the disal margins
214	**'Serrations' created on the surface of the carinae by the conspicuous superficial ornamentation of enamel (false-ziphodonty, sensu Prasad & Broin, 2002):** 0. absent 1. present
215	**True denticles (true-ziphodonty, sensu Prasad & Broin, 2002):** *In Thalattosuchia, basal geosaurines code as state (1).* *Derived genera within Geosaurini codes as state (2).* 0. absent 1. incipient denticles that are poorly defined (hard to discern, in some cases even under Scanning Electron Microscopy). Typically, they either alter the height of the carinal keel very little or not at all (definition described in Young *et al*., 2013) 2. well defined denticles (can be discerned with or without optical aids)
216	**Carinae and true denticles, progression along the carinae:** *In Thalattosuchia, basal geosaurines code as state (1).* *Derived genera within Geosaurini codes as state (2).* *Note that this character and character describing possession of true denticles currently co-correlate. However, the two morphologies are not the same, and it is possible that taxa can code differently for these two characters (i.e. the ziphomorphy condition – see Andrade & Bertini, 2008).* 0. denticles are absent, or present on their own (i.e., they do not form a series) 1. heterogeneous carina, denticles form short rows (of 2-10 denticles) and do not proceed contiguously along the entire carina 2. homogeneous carina, denticles form a contiguous, or near contiguous, series along the entire carina
217	**Denticle shape, when observed in lingual or labial view:** *In Thalattosuchia,* Plesiosuchus *codes as state (0).* 0. "chisel"-shaped or rectangular

	1. rounded
218	**Denticle distribution across the dentition:** Dakosaurus *codes as state (1).* *At present no taxon is known to combine the microziphodont and macroziphodont conditions. However, it is entirely possible that such a taxon could occur. As such, state (3) was created.* *In Thalattosuchia,* Dakosaurus *codes as (2), while* 'Metriorhynchus' brachyrhynchus, Tyrannoneustes lythrodectikos*,* Torvoneustes*,* Geosaurus *and* Plesiosuchus *codes as (1).* 0. all or most teeth lack denticles 1. all teeth are microziphodont (sensu Andrade et al., 2010) 2. all teeth are macroziphodont (sensu Andrade et al., 2010) 3. teeth show variation in denticle size (with both microziphodonty and macroziphodonty)
219	**Occlusion, relation between maxillary and dentary series:** 0. in-line or interlocked 1. maxillary dentition overbites dentary dentition
220	**Morphology of enamel surface ornamentation, apicobasal ridges:** *In Thalattosuchia,* Geosaurus*,* Dakosaurus, Rhacheosaurus *and* Cricosaurus *code as state (0).* Tyrannoneustes *codes as state (1).* Plesiosuchus manselii *codes as state (2).* 0. enamel ornamentation absent macroscopically, although under SEM microscopic ripples may be present 1. enamel ornamentation largely absent, with on the basal half of the crown short, well-spaced, well-defined apicobasally aligned ridges 2. composed of numerous apicobally aligned ridges that are of low-relief (can only be properly viewed with visual aids), set close to each other, but become shorter and well spaced towards the carinae 3. composed of numerous well-defined apicobasally aligned ridges, conspicuous and set close to each other
221	**Morphology of enamel surface ornamentation, macroscopic anastomosed pattern:** 0. absent 1. present and strongly developed, but only in the apical region of the crown

Axial post-cranial skeleton

Character	Description
222	**Atlas, hypocentrum length:** 0. long: >15% of odontoid process length 1. short: subequal to odontoid process length (±5%)
223	**Axis, neural arch diapophysis:** 0. absent 1. present
224	**Presacral vertebrae number:** 0. 24 1. 25
225	**Number of cervico-dorsal vertebrae where the parapophyses are borne on the**

	centrum ('cervical vertebrae'), including the atlas-axis: 0. 9 or 10 1. 8 2. 7
226	**Cervical vertebrae, shape:** *Modified from (Clark, 1994: ch. 92)* *State (2) is an apomorphy of Eusuchia.* 0. amphicoelous or amphyplatian 1. weakly procoelous (i.e. the Isisfordia morphotype – posterior condyle is poorly developed, with the rim of the posterior face of the centrum still distinct from the convexity of the condyle) 2. strongly procoelous (i.e. the eusuchian morphotype – well-developed posterior condyle, which is formed by the entire posterior face of the centrum)
227	**Cervical vertebrae, centrum length vs centrum width:** 0. long (centrum, length >1.5 the centrum width) 1. moderate (centrum length - width subequal ±5%) 2. short (centrum length <0.95 the centrum width)
228	**Middle cervical vertebrae, neural spine height relative to centrum height:** *Currently, there is not the information to code most crocodylomorphs. Within Thalattosuchia* Steneosaurus edwardsi *is 0,* St. leedsi *codes as 1, and metriorhynchids as state 2.* 0. neural spine height is greater than centrum height 1. neural spine and centrum heights are approximately equal 2. neural spine height is less than centrum height
229	**Number of cervico-dorsal vertebrae where the parapophyses are borne on the neural arch ('thoracic vertebrae'):** *This character, (along with character 184, categorising lumbral vertebrae) was formulated to help understand the regionalisation of the presacral column. Currently, there is not the information to code most crocodylomorphs.* 0. 12 1. 13 2. 14 3. 15
230	**Number of cervico-dorsal vertebrae posterior to the "thoracic vertebrae" and anterior to the sacral vertebrae where the parapophyses are no longer borne on the neural arch ('lumbral vertebrae'):** *This character, (along with character 183, categorising thoracic vertebrae) was formulated to help understand the regionalisation of the presacral column. Currently, there is not the information to code most crocodylomorphs.* 0. 2 1. 3 2. 4
231	**Thoracic and lumbral vertebrae, shape:** *Modified from (Clark, 1994: ch. 93)* *State (2) is an apomorphy of Eusuchia.* 0. amphicoelous or amphyplatian

	1. weakly procoelous (i.e. the Isisfordia morphotype – posterior condyle is poorly developed, with the rim of the posterior face of the centrum still distinct from the convexity of the condyle) 2. strongly procoelous (i.e. the eusuchian morphotype – well-developed posterior condyle, which is formed by the entire posterior face of the centrum)
232	**Thoracic vertebrae, shallow fossa on the anterior margin of the diapopohysis immediately lateral to the parapophysis:** *State (1) is a apomorphy of metriorhynchids, best observed in thoracic vertebrae mid-to-late in the series* 0. present 1. absent
233	**Thoracic vertebrae, orientation of parapophysis:** *State (1) is an apomorphy of Metriorhynchidae.* 0. posteriorly or horizontal 1. anteriorly
234	**Anterior thoracic vertebrae, parapophysis in relation to the diapophysis:** *Currently, there is not the information to code most crocodylomorphs. Within Thalattosuchia* Steneosaurus edwardsi *and* St. leedsi *are state 0, and metriorhynchids code as state 1.* 0. parapophysis ventral to, or level with, diapophysis (when observed in lateral view) 1. parapophysis dorsal to diapophysis (when observed in lateral view)
235	**Anterior thoracic vertebrae, neural spine height relative to centrum height:** *Currently, there is not the information to code most crocodylomorphs. Within Thalattosuchia* Machimosaurus mosae *and* Steneosaurus edwardsi *are 0, and* St. leedsi *and metriorhynchids code as state 1.* 0. neural spine and centrum heights are approximately equal 1. neural spine height is less than centrum height
236	**''Insertion'' of a sacral vertebra between the first and second primordial sacral vertebrae:** *Nesbitt (2011: ch. 207).* *This character codes for the "third" sacral found in certain taxa (e.g.* Machimosaurus*). Within Thalattosuchia, evidence for three sacral vertebrae is found in* 'Steneosaurus' obtusidens *and* Machimosaurus. 0. absent 1. present
237	**Last sacral vertebra, shape of centrum posterior face:** *State (1) is an apomorphy of Geosaurini* 0. circular to sub-circular, with an equatorial bulge 1.distinctly oval, transverse width considerably greater than dorsoventral height
238	**Caudal vertebrae, shape:** *Clark (1994: ch. 94)* 0. All are: amphicoelous or amphyplatian 1. first caudal biconvex with the rest being procoelous 2. or all are procoelous
239	**Caudal vertebrae, number:** 0. less than 46

	1. more than 50
240	**Tail, vertebrae morphology near distal end:** *State (1) is an apomorphy of Metriorhynchidae. Character re-phrased based on Andrade (2010).* 0. non-hypocercal, distal vertebrae isomorphic to poorly heteromorphic 1. hypocercal, caudal series clearly heteromorphic, with a section of the distal vertebrae defining the lower lobe of a tail fin
241	**Axis rib:** *State (1) is an apomorphy of* Pelagosaurus *and Metriorhynchidae. Callovian teleosaurids have a distinct 'bump' or 'process' where a second articular head would be (see Andrews, 1913). However, in no specimen is there a second articular head preserved.* 0. holocephalous (rib elongate, with one articular head) 1. dichocephalous (rib triradiate, with two articular heads)
242	**Axis rib, tuberculum:** 0. wide with broad dorsal tip 1. narrow with acute dorsal tip
243	**Sacral vertebra 1, orientation of the transverse processes:** *State (1) is an apomorphy of Thalattosuchia.* 0. horizontal 1. arched ventrally
244	**Sacral vertebrae, relative position of lateral end of the transverse processes (= sacral ribs):** *State (1) is an apomorphy of* Pelagosaurus *and Metriorhynchidae.* *This character scores the ventral arching of sacral vertebrae 1 and 2 (as this characteristic is only seen when it occurs for both sacrals)* 0. level with the vertebral centrum 1. ventral relative to the vertebral centrum, transverse processes of both sacrals lateroventrally directed
245	**Chevrons (=haemal arches), shape (posterior chevrons have a anterodorsal process):** *State (1) is an apomorphy of Metriorhynchidae.* 0. either 'V' or 'Y'-shaped, no distinct anterodorsal process 1. posterior chevrons have a 'W'-shape when observed in anterior view, formed by a anterodorsal process rising between the 'Y'-shape

Appendicular skeleton

Character	Description
246	**Coracoid, shape:** *State (1) occurs in teleosaurids and basal metriorhynchoids, while state (2) occurs in Metriorhynchidae* 0. neither proximal nor distal end are fan-shaped, having angular margins 1. distal end convex, forming a gentle fan-shape while the proximal (scapula-articular) end is triangular in shape with blunt ends 2. both proximal and distal ends are convex
247	**Coracoid, postglenoid process: (NEW)**

	Nesbitt (2011: ch. 223) *State (0) occurs in non-crocodylomorphs, state (1) occurs in 'sphenosuchians', while state (2) is an apomorphy of Crocodyliformes+Thalattosuchia* 0. short 1. elongate and expanded posteriorly only 2. elongate and expanded anteriorly and posteriorly
248	**Coracoid, posteroventral edge, deep groove: (NEW)** *Nesbitt (2011: 224)* 0. absent 1. present
249	**Scapula blade:** *State (1) is an apomorphy of Thalattosuchia.* 0. scapula blade very large: more than 200% of the width of the scapular shaft, generally wider than the distal glenoid region 1. scapula blade reduced: being as narrow, or narrower than, the proximal region and less than 150% the width of the scapular shaft
250	**Scapula, anterior and posterior margins in lateral aspect:** *New character state* 0. symmetrically concave in lateral view 1. anterior edge more strongly concave than posterior edge 2. posterior edge more strongly concave than anterior edge
251	**Scapula, deltoid crest:** 0. present 1. absent
252	**Scapula/Humerus, size:** 0. humerus longer than scapula (> 15%) 1. humerus and scapula subequal in length (± 13%) 2. humerus shorter in length than scapula (< 15%)
253	**Humerus, proximal head:** *Modified character 232 from Nesbitt (2011) - added state (2)* *In thalattosuchians derived teleosaurids (*S. bollensis, S. leedsi, S. edwardsi, S. priscus*) have state (2) - the posterior deflection is much pronounced than in other thalattosuchian* *In Geosaurini and Rhacheosaurini taxa change to state (0)* 0. confined to the proximal surface 1. posteriorly expanded and hooked 2. very strongly posteriorly deflected and hooked, with the posterior proximal head noticeably posterior to the distal head.
254	**Humerus, proximomedial articular surface:** 0. strongly convex 1. weakly convex
255	**Humerus, deltopectoral crest:** *State (2) (absent/vestigial) has been removed, as metriorhynchids of the subclade Rhacheosaurini do indeed possess a deltopectoral crest* 0. present and distinct from the proximal surface 1. present, but continuous with the proximal surface

256	**Humerus, shape:** *State (1) is an apomorphy of Metriorhynchidae* 0. has typical long bone morphology (longer than wide at distal end) 1. broadly expanded and plate-like
257	**Humerus, length of the shaft relative to total humerus length:** *This character quantifies the reduction in humeral shaft size in Metriorhynchidae* 0. shaft contributing more than 50% of total humeral length 1. shaft contributes between 35-38% of total humeral length 2. shaft contributes less than 25% of total humeral length
258	**Humerus-antebrachium joint surface:** *State (1) is an apomorphy of Metriorhynchidae* 0. complex, allowing one degree of motion 1. planar, limiting possible motion
259	**Radius, shape:** *State (1) is an apomorphy of Metriorhynchidae.* 0. has typical long bone morphology (longer than width at distal end) 1. broadly expanded and plate-like
260	**Radiale, shape:** *State (1) is an apomorphy of Metriorhynchidae.* 0. has typical long bone morphology (longer than width at distal end) 1. broadly expanded and plate-like
261	**Ulna, shape:** *State (1) is an apomorphy of Metriorhynchidae.* 0. has typical long bone morphology (longer than width at distal end) 1. broadly expanded and plate-like
262	**Ulnare, shape:** *State (1) is an apomorphy of Metriorhynchidae.* 0. has typical long bone morphology (longer than width at distal end) 1. broadly expanded and plate-like
263	**Metacarpal 1, shape:** *State (1) is an apomorphy of Metriorhynchidae.* 0. elongate, more than twice long as wide 1. broadly expanded, maximum width at least 60% total length
264	**Pubis, contribution to acetabulum:** *Turner & Sertich (2010: 86)* 0. forms anterior half of ventral edge of acetabulum 1. contacting ilium but partially excluded from acetabulum by anterior process of ischium 2. completely excluded from acetabulum by anterior process of ischium
265	**Pubis, length: (NEW)** *Nesbitt (2011: ch. 278)* 0. less than 70% of femoral length 1. 70% or more of femoral length
266	**Ilium, posterior process presence:** *Character 128 in Young & Andrade (2009), Andrade et al. (2010), Young et al. (2011a).*

	0. present 1. absent
267	**Ilium, posterior margin expanded into a thin “fan”-shape:** *State (1) is an apomorphy of Teleosauridae (except* in basal taxaPlatysuchus multiscrobiculatus, Teleosaurus cadomensis, Steneosaurus gracilirostris *and* S. bollensis*). This structure appears to replace the posterior process in these taxa. At present it is not clear whether it is homologous to the posterior process* 0. no 1.yes, posterior margin is expanded into a thin “fan”-shape that extends from the iliac crest to the ventral margin
268	**Illium, size:** 0. large (length of dorsal border at least 30% of femur length) 1. small (length of dorsal border less than 21% of femur length)
269	**Ilium, in lateral view, the orientation of the dorsal margin of the articulation facet that contributes to the acetabulum is:** *State (1) is an apomorphy of* Tyrannoneustes lythdrodectikos 0. ventrally orientated 1. horizontally oriented
270	**Ilium, dorsal border length in lateral view:** *State (1) is an apomorphy of* Tyrannoneustes lythdrodectikos 0. long, terminates at least level to the articulation facet that contributes to the acetabulum 1. short, terminates prior to the articulation facet that contributes to the acetabulum
271	**Ischium, anterior process:** 0. developed – with clearly defined articulation facets for pubis and ilium; additionally, anterior process is at least half as wide as the posterior process 1. reduced – lacks both articulation facets, and is 30-50% as wide as posterior process 2. highly reduced – lacking both articulation facets, and is < 25% as wide as posterior process
272	**Femur, proximal portion, posteromedial tuber:** *Nesbitt (2011: ch. 301), character states re-ordered.* 0. absent 1. present and small 2. present and largest of the proximal tubera
273	**Femur, proximal condylar fold:** *Nesbitt (2011: 312)* 0. absent 1. present
274	**Femur, ridge of attachment of the M. caudifemoralis:** *Modified from Nesbitt (2011: 315)* *Note: we code thalattosuchians as state (0). They lack a fourth trochanter sensu stricto, as they only have a large flattened rugose area for the muscle attachment, not a distinct process.* 0. absent, flattened rugose area 1. low and without a distinct medial asymmetrical apex (= fourth trochanter)

	2. bladelike with a distinct asymmetric apex located medially
275	**Lateral edge of proximal articular surface of femur (lesser trochanter):** 0. rounded 1. ‘squared’ with enlarged scar for musculus ischiotrochantericus
276	**Femur, medial condyle of the distal portion:** *Nesbitt (2011: ch. 320)* 0. tapers to a point on the medial portion in distal view 1. smoothly rounded in distal view
277	**Femur, distal surface between the lateral and medial condyles:** *Nesbitt (2011: ch. 321)* 0. nearly flat or flat 1. groove separating the medial condyle from the lateral condyle
278	**Hind limb, distal to proximal bone length ratio: (ORDERED)** *This character is designed to help elucidate variation in the proportions of the hind limb. In Thalattosuchia state (3) is an apomorphy of both Metriorhynchinae and* Steneosaurus priscus*, with derived metriorhynchines being state (4). Middle Jurassic teleosaurids (and the Late Jurassic genus* Machimosaurus*) and Geosaurinae code as state (1).* *= tibia : femur* 0. greater than 0.5 1. between 0.4 and 0.5 2. between 0.3 and 0.4 3. less than 0.3
279	**Calcaneum tuber:** *State (2) absent/vestigial calcaneum tuber is removed, as observation of an unnumbered* Cricosaurus suevicus *skeleton in SMNS has the tuber.* 0. well developed – with long neck (subequal in length to main body of calcaneum ±5%), distal end wider than main body of calcaneum and projects inwards the body at >80 degress 1. poorly developed – short neck (< half length of calcaneum main body), distal end < half the width of calcaneum main body width & projects out straight from calcaneum
280	**Metatarsals, length:** 0. metatarsals 1-4 longer than digits (>20%) 1. metatarsals 2-4 shorter than digits (< 90%)
281	**Metatarsal I, proximal end expansion:** 0. proximal end not enlarged (no more than 10% wider than any other metatarsal) 1. enlarged (20-30% wider) 2. moderately enlarged (46-51%) 3. greatly enlarged (>75% wider)
282	**Pedal digit V, metatarsals and phalanges: (NEW)** *Re-phrased from Nesbitt (2011: ch. 399)* *State (0) occurs in non-crocodylomorphs, state (1) occurs in 'sphenosuchians', while state (2) is an apomorphy of Crocodyliformes+Thalattosuchia* 0. present and ‘‘fully’’ developed first phalanx 1. present and ‘‘poorly’’ developed first phalanx

	2. without phalanges and metatarsal tapers to a point
283	**Pes, digit lengths:** 0. digit lengths in descending order III, IV, II, I 1. IV, III, II, I (digit IV elongated, creating a paddle-like shape as each digit is ~10% shorter)
284	**Forelimb – hind limb, length ratio:** *Character re-designed, based on Character 212 of Nesbitt (2011), number of character states expanded to reflect the forelimb reduction in Thalattosuchia* *= humerus + radius : femur + tibia* 0. greater than 0.55 1. between 0.45 and 0.55 2. less than 0.45

Dermal Armour

Character	Description
285	**Osteoderms, dorsal to the vertebral column:** *Character 401 in Nesbitt (2011)* *Metriorhynchidae have state (0)* 0. absent 1. present
286	**Dorsal osteoderms, presence of a 'peg-like' anterolateral process (forming a stylofoveal joint):** *Note that this process does not include the lateral processes seen in dyrosaurids, as they articulate with the accessory osteoderms* *This character scores for a similar morphology as that in Character 403 in Nesbitt (2011)* 0. absent 1. present
287	**Dorsal osteoderms, paravertebral only:** *Nesbitt (2011: ch. 404)* *Crocodile-line archosaurs including, basal crocodylomorphs, have state (1)* *In Thalattosuchia,* Steneosaurus gracilirostris, Teleosaurus *and* Platysuchus *have state (1)* *Crocodyliformes have state (0)* 0. flat or weakly arched 1. distinct longitudinal bend near lateral edge
288	**Osteoderms, covering the appendages (= appendicular osteoderms), at least in part: (NEW)** *Nesbitt (2011: ch. 405)* *Crocodyliformes have state (1)* *Limb osteoderms are rarely preserved, but have been mentioned for some dyrosaurids and advanced neosuchians.* 0. absent 1. present
289	**Osteoderms, biserial or tetraserial dorsal shield:** 0. Biserial dorsal shield (one pair of paramedian osteoderm per row)

	1. Tetraserial dorsal shield (two pairs of paramedian osterderms per row)
290	**Osteoderms, presence of accessory osteoderm column that do not have a peg-like articulation with the paramedian column, and which are smaller in size than the paramedian column(s):** *This state does not consider the accessory osteoderms of dyrosaurids to be homologous (see character relating to the 'lateral process')* *This state does not consider the accessory osteoderms of notosuchians to be homologous, as there the accessory osteoderms can retain the same size and shape as the paramedian column* 0. absent 1. present
291	**Osteoderms, presence of accessory osteoderm column that does have a peg-like articulation with the paramedian column (through a 'lateral process' derived from the anterolateral margin of the paramedian osteoderms)** *Modified from: Jouve et al. (2008: ch. 37), Hastings et al. (2010: ch. 82)* *State (1) occurs in dyrosaurids* *This character was derived to test the homology of accessory osteoderms in dyrosaurids* 0. absent 1. present
292	**Pre-sacral osteoderms (thoracic), dimensions:** *Nesbitt (2011: ch. 407)* *Crocodile-line archosaurs, including basal crocodylomorphs, have state (1).* *In Thalattosuchia, cervical osteoderms can be either state (0) or (1), so this character has been altered not to include the cervical osteoderms* *Crocodyliformes and Thalattosuchia have state (2)* 0. square shaped, length and width approximately equal 1. longer than wide 2. wider than long
293	**Osteoderm anterior margin, presence of a 'smooth' (unornamented) surface, upon which the preceding osteoderm overlaps: (NEW)** *Re-phrased from Nesbitt (2011: ch. 408)* *Crocodyliformes and Thalattosuchia have state (1)* 0. absent 1. present
294	**Ventral osteoderms forming a carapace in the trunk region:** *Re-phrased from Nesbitt (2011: ch. 409)* *Crocodyliformes and Thalattosuchia have state (1)* 0. absent 1. present
295	**Dorsal tail osteoderm distribution:** *Character previously coded for both the ventral and dorsal caudal rows together. This character was split as* Pelagosaurus *and* Pietraroiasuchus *lack ventral caudal osteoderms, but have dorsal caudal osteoderms.* 0. present, covering at least half of the tail 1. present, covering less than half of the tail

	2. absent
296	**Ventral tail osteoderm distribution:** *State (1) is an apomorphy of* Pelagosaurus + *Metriorhynchidae, and occurs in* Pietraroiasuchus 0. present 1. absent
297	**Osteoderm dorsal surface, ornamentation:** *State (2) is an apomorphy of* Machimosaurus 0. small round to ellipsoid pits in very densely distributed 1. large round to ellipsoid pits, well separated from one another 2. pits variable in size and length, from small to large, but on osteoderms with a keel, the pits can become elongate grooves
298	**Osteoderm dorsal surface, keel (longitudinal ridge):** *State (1) is an apomorphy of* Pelagosaurus *In Thalattosuchia the cervical and anterior dorsal osteoderms can have reduced keels, which can make it look as those they are absent.* *In Thalattosuchia, the sacral and anterior-mid caudal osteoderms have raised keels* 0. present along the entire (or almost all) the paravertebral osteoderms 1.absent on most/all paravertebral osteoderms

Character-Taxon matrix:

			1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57
58	59	60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92	93
94	95	96	97	98	99	100	101	102	103	104	105
106	107	108	109	110	111	112	113	114	115	116	117
118	119	120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139	140	141
142	143	144	145	146	147	148	149	150	151	152	153
154	155	156	157	158	159	160	161	162	163	164	165
166	167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188	189
190	191	192	193	194	195	196	197	198	199	200	201
202	203	204	205	206	207	208	209	210	211	212	213
214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237
238	239	240	241	242	243	244	245	246	247	248	249
250	251	252	253	254	255	256	257	258	259	260	261
262	263	264	265	266	267	268	269	270	271	272	273
274	275	276	277	278	279	280	281	282	283	284	285
286	287	288	289	290	291	292	293	294	295	296	297
298											
Postosuchus_kirkpatricki			?	2	?	0	?	0	?	0	0
1	0	0	0	3	?	0	0	0	0	?	1
0	0	0	1	0	0	0	0	0	0	?	0
0	0	0	0	1	0	1	0	1	0	0	0
0	0	1	0	1	0	0	0	1	0	1	0
0	0	?	1	1	0	0	?	1	?	0	0
0	?	0	0	0	0	0	0	1	1	0	?
0	1	0	0	3	2	0	1	0	0	0	?
?	1	0	0	0	1	0	?	0	?	?	0
0	0	?	?	0	?	?	?	0	0	0	0
0	2	0	?	0	?	1	0	0	1	0	?
?	?	?	0	?	?	0	0	?	0	?	0
0	0	?	0	?	0	0	0	0	?	?	?

148	0	2	0	?	?	?	?	0	?	?	?	0
149	?	?	?	?	0	0	0	0	0	0	?	0
150	?	?	?	?	1	1	0	2	?	?	?	?
151	?	0	0	0	0	0	?	?	?	?	?	2
152	0	?	0	?	0	0	?	0	0	0	1	1
153	?	?	?	?	?	?	?	?	?	?	?	?
154	0	?	?	?	?	0	?	?	?	?	0	?
155	?	?	0	?	?	?	?	?	?	0	?	?
156	2	?	?	1	0	0	0	0	0	0	0	0
157	0	?	0	?	0	0	0	?	?	?	1	1
158	?	?	?	1	0	0	?	?	?	?	0	?
159	1	1	0	?	?	0	1	0	0	?	?	?
160	?											
161	Dromicosuchus_grallator			?	2	?	0	0	0	?	0	?
162	0	0	0	0	0	?	0	0	0	0	?	1
163	0	?	0	2	?	0	0	?	0	0	?	0
164	0	0	0	0	1	0	0	0	0	0	0	?
165	?	?	1	0	0	0	0	1	1	0	?	0
166	0	0	?	0	0	0	0	2	1	1	0	0
167	?	1	0	1	0	0	0	0	?	1	0	?
168	0	1	0	0	3	0	0	0	0	0	0	?
169	?	?	0	0	0	1	1	?	0	?	?	?
170	2	?	?	?	?	?	?	?	?	0	?	?
171	?	?	?	?	?	?	?	?	?	0	0	?
172	?	?	?	0	?	?	?	?	?	0	?	1
173	?	0	?	0	?	?	0	?	?	?	?	?
174	?	2	?	?	?	?	?	0	?	?	?	?
175	?	?	0	?	0	0	0	?	?	0	?	0
176	?	?	?	?	0	2	0	?	?	?	?	?
177	?	?	?	?	?	?	?	?	?	?	0	2
178	0	0	0	?	?	?	0	0	0	0	1	1
179	?	2	2	0	2	?	?	?	?	0	?	?
180	0	0	?	?	?	?	?	?	?	?	0	?
181	?	?	?	0	?	0	0	?	?	1	1	?
182	?	?	?	1	0	0	0	0	?	0	?	?
183	?	?	?	1	?	?	0	?	?	?	1	1
184	1	0	1	0	0	?	?	?	?	?	0	1
185	?	1	0	0	0	0	1	0	0	?	?	?
186	0											
187	Hesperosuchus_"agilis"			?	2	?	0	0	0	?	0	0
188	0	0	0	0	0	?	0	0	0	0	?	?
189	0	1	0	2	?	0	0	0	0	0	1	0

190	0	0	0	0	1	0	0	0	1	0	0	?
191	?	?	1	0	0	0	0	1	1	0	?	0
192	0	0	?	0	0	0	0	2	1	1	0	0
193	0	1	0	1	0	0	0	?	?	1	0	?
194	0	1	0	0	3	0	?	?	0	0	0	?
195	?	1	0	?	0	?	1	?	0	?	0	?
196	2	?	?	?	?	?	?	?	?	?	?	?
197	?	?	?	?	?	?	?	?	?	0	0	?
198	?	?	?	0	?	?	?	?	?	0	?	1
199	?	0	?	0	0	?	0	?	?	?	1	0
200	0	2	0	?	?	0	?	0	?	?	?	?
201	?	?	?	?	0	0	0	?	0	0	?	0
202	?	?	?	?	0	1	0	?	?	?	?	?
203	?	?	?	?	?	?	?	?	?	?	0	2
204	0	0	0	?	0	?	0	0	0	0	1	1
205	0	2	2	0	2	?	?	?	?	?	?	?
206	0	0	?	?	?	?	?	?	?	?	?	?
207	?	?	?	0	?	?	?	?	?	?	?	?
208	1	1	0	1	0	0	0	0	0	0	?	?
209	?	0	?	?	?	?	?	?	?	?	1	1
210	?	?	1	?	?	?	?	?	?	?	?	1
211	1	1	0	0	0	0	1	0	0	?	?	?
212	0											
213	Dibothrosuchus_elaphros			?	2	?	0	0	0	?	0	0
214	?	0	0	0	3	?	0	0	0	0	?	1
215	0	1	0	0	?	0	0	0	0	0	1	0
216	1	0	0	0	1	0	0	0	0	0	0	0
217	0	0	1	0	0	0	0	1	0	0	0	0
218	0	0	?	0	0	0	0	?	1	?	0	?
219	1	1	0	0	?	?	?	?	?	?	0	?
220	1	2	?	0	2	0	0	0	0	0	0	?
221	?	?	0	?	?	?	1	?	0	?	?	?
222	1	?	0	1	0	?	?	?	0	0	0	0
223	0	0	0	?	0	?	?	?	?	0	0	?
224	?	?	?	?	?	?	0	?	?	?	?	1
225	0	0	0	0	?	?	0	?	?	?	?	?
226	0	0	?	?	?	?	?	0	?	?	?	?
227	?	?	?	?	0	0	0	0	0	?	?	0
228	?	?	?	?	0	1	0	2	?	?	?	?
229	?	?	?	?	?	?	?	?	?	?	?	?
230	?	?	0	?	?	?	?	0	0	0	1	?
231	?	?	?	?	?	?	?	?	?	?	?	?
232	?	?	?	?	?	?	?	?	?	?	?	?

233	?	?	?	?	?	?	?	?	?	1	1	?
234	?	?	?	?	?	?	?	?	?	?	?	?
235	?	?	?	?	?	?	?	?	?	?	?	?
236	?	?	?	?	?	?	?	?	?	?	?	?
237	?	?	?	?	?	?	?	?	?	?	?	?
238	?											
239	Terrestrisuchus_gracilis			?	2	?	0	0	0	?	0	0
240	?	?	?	?	?	?	0	0	0	0	?	?
241	0	1	0	0	?	0	0	?	0	0	1	0
242	0	0	0	0	1	?	?	0	0	0	0	?
243	?	?	1	0	0	0	0	1	1	0	0	0
244	0	0	?	0	0	0	0	2	?	0	0	0
245	0	1	0	1	0	0	0	0	1	1	0	?
246	?	2	?	0	3	0	?	?	0	0	0	?
247	?	?	0	0	0	1	1	1	0	?	?	?
248	2	?	0	1	0	?	?	?	0	0	0	0
249	0	?	0	?	0	?	?	0	0	0	0	?
250	?	0	?	?	?	0	0	?	0	0	0	?
251	?	?	?	0	0	?	0	?	0	?	?	0
252	0	0	0	0	0	0	?	0	?	?	?	?
253	?	?	0	?	0	0	0	?	?	0	?	0
254	?	?	0	0	0	1	0	1	?	?	?	?
255	?	?	?	?	?	?	?	?	?	?	0	2
256	0	0	?	?	?	0	0	0	0	0	1	1
257	?	2	2	0	2	?	?	?	0	0	0	0
258	0	0	?	?	?	0	0	0	?	?	0	?
259	?	?	0	?	0	0	0	0	0	1	1	?
260	1	?	0	1	0	0	0	0	0	?	?	0
261	?	0	0	1	0	0	0	?	?	0	1	1
262	1	0	1	0	0	0	0	0	1	0	0	1
263	?	1	0	0	0	?	1	0	0	?	?	?
264	?											
265	Protosuchus	?	2	?	0	1	0	?	0	0	0	0
266	0	0	0	?	0	0	0	0	?	0	0	1
267	0	0	0	0	0	0	0	0	0	0	0	0
268	0	0	0	0	0	0	0	0	1	1	0	0
269	0	0	0	0	0	1	0	0	?	0	?	0
270	?	0	0	0	0	0	0	0	0	?	1	0
271	0	0	0	0	0	0	1	1	1	0	1	0
272	0	1	2	0	0	0	0	0	0	?	?	0
273	0	0	0	1	1	1	0	0	0	1	2	0
274	0	1	0	?	?	?	0	0	0	0	0	?

275	0	0	0	0	0	0	0	?	0	0	0	0
276	?	?	0	?	0	0	0	0	0	1	1	0
277	1	1	0	0	0	0	0	?	2	0	0	0
278	0	0	0	0	0	0	0	0	?	0	1	0
279	0	0	1	0	0	?	0	0	?	0	?	0
280	0	0	1	1	0	?	?	?	?	?	?	0
281	?	?	?	0	?	?	?	?	0	2	0	0
282	0	?	0	0	0	0	0	0	2	1	?	?
283	?	?	?	?	?	?	0	0	0	0	0	?
284	?	?	?	0	0	0	?	?	0	?	0	0
285	0	?	0	?	?	0	0	2	0	0	1	1
286	0	?	0	0	0	0	0	0	?	?	?	0
287	1	0	0	0	0	?	?	0	1	1	1	0
288	1	1	0	0	0	0	2	0	0	1	1	0
289	1	0	0	0	2	1	1	0	0	?	0	
290	Alligatorium_meyeri		?	1	0	0	1	0	?	1	0	1
291	?	?	0	?	?	0	0	?	0	?	0	?
292	1	?	1	0	0	0	0	?	0	?	0	?
293	?	?	?	?	?	?	0	?	0	1	1	?
294	0	0	1	0	0	0	2	0	0	?	0	?
295	0	?	0	0	0	0	0	2	0	0	0	1
296	2	0	0	0	0	0	0	1	1	?	?	1
297	0	0	?	1	0	0	0	0	0	0	?	?
298	1	0	1	0	1	1	?	?	0	0	1	2
299	0	?	?	?	?	?	?	?	?	?	?	?
300	?	?	?	?	?	?	?	?	?	?	?	?
301	?	?	?	?	?	?	?	?	?	?	?	?
302	?	?	?	?	?	?	?	?	?	?	0	0
303	0	0	0	0	?	?	0	?	?	?	0	?
304	?	?	?	0	0	?	0	?	?	?	0	?
305	?	?	?	?	?	0	?	?	?	?	?	?
306	?	?	?	?	?	?	?	?	?	0	1	0
307	0	0	?	?	?	0	0	0	0	1	?	?
308	?	?	?	?	?	?	?	?	?	?	?	0
309	0	?	?	?	0	?	?	?	?	?	?	?
310	?	?	?	?	?	?	?	?	?	?	?	?
311	?	?	?	?	?	0	0	0	0	0	0	0
312	0	?	?	?	?	?	?	?	?	?	?	?
313	?	?	?	?	0	0	0	2	?	?	1	1
314	?	?	0	0	0	2	1	?	?	?	?	?
315	Theriosuchus_guimarotae			?	1	0	0	1	0	?	1	0
316	1	?	0	0	2	?	0	0	0	0	?	0

317	0	?	0	2	0	0	0	?	0	0	?	0
318	0	1	0	0	0	0	0	0	0	0	1	1
319	1	0	0	1	0	0	0	2	0	0	?	0
320	?	0	?	0	0	0	0	0	1	0	?	?
321	1	2	0	0	0	0	0	0	1	1	1	1
322	1	0	0	1	1	0	0	0	0	0	0	?
323	?	1	0	1	0	0	1	0	1	0	1	?
324	1	1	1	0	1	?	0	0	0	0	1	0
325	0	?	0	?	0	?	?	0	1	?	?	?
326	0	0	?	?	0	0	0	0	0	0	1	1
327	1	?	?	1	1	0	1	2	?	?	?	0
328	0	0	0	0	0	0	2	0	0	0	?	0
329	1	0	0	0	0	0	1	0	1	1	?	0
330	0	2	0	0	0	{1,2}	0	1	?	?	?	?
331	?	?	?	?	?	0	0	0	2	?	0	?
332	?	?	0	?	?	?	0	0	0	0	?	1
333	?	2	2	0	?	?	?	?	0	1	?	0
334	0	?	?	?	?	0	0	0	?	?	?	?
335	0	0	0	?	0	0	0	0	0	2	?	?
336	1	?	0	0	0	0	0	0	?	?	?	?
337	?	0	2	?	0	0	0	?	?	0	?	?
338	1	1	?	?	0	0	0	0	?	0	?	1
339	1	?	?	0	0	0	2	1	?	0	0	?
340	?											
341	Calsoyasuchus_valliceps			?	1	0	0	1	0	?	1	0
342	1	0	0	0	0	?	0	0	1	0	?	1
343	0	1	0	1	1	1	0	0	1	1	1	0
344	0	0	1	0	1	1	1	0	1	0	1	?
345	?	0	0	0	0	0	0	2	?	0	?	0
346	0	0	?	0	0	0	0	0	?	0	0	?
347	0	0	0	0	0	0	0	?	?	?	1	0
348	?	?	?	?	1	0	0	0	0	0	0	?
349	?	?	0	?	1	1	1	0	1	?	?	?
350	?	?	?	?	?	?	?	?	?	0	0	?
351	?	?	?	?	0	?	?	?	?	?	?	?
352	?	?	?	?	0	0	?	?	?	0	?	?
353	?	?	?	?	?	?	?	?	?	?	?	?
354	?	0	0	?	?	?	?	?	?	?	?	?
355	?	?	?	?	?	?	?	?	?	?	?	?
356	?	?	?	?	0	4	0	?	?	?	?	?
357	?	?	?	?	?	?	?	?	?	?	?	?
358	?	?	?	?	0	?	?	?	?	?	?	?
359	?	?	?	?	?	?	?	?	?	?	?	?

360	?	?	?	?	?	?	?	?	?	?	?	?
361	?	?	?	?	?	?	?	?	?	?	?	?
362	?	?	?	?	?	?	?	?	?	?	?	?
363	?	?	?	?	?	?	?	?	?	?	?	?
364	?	?	?	?	?	?	?	?	?	?	?	?
365	?	?	?	?	?	?	?	?	?	?	?	?
366	?											
367	Eutretauranosuchus_delfsi			?	1	0	0	1	0	?	1	0
368	?	?	0	0	?	?	0	0	1	0	?	0
369	0	1	0	2	1	1	0	0	0	0	0	0
370	0	2	?	?	?	?	?	0	0	0	1	1
371	1	0	0	0	0	0	0	1	0	0	0	0
372	?	0	?	0	0	0	0	0	0	0	?	?
373	0	1	0	0	0	1	0	0	1	1	1	1
374	1	0	0	1	1	0	0	0	0	0	0	?
375	?	?	0	1	0	1	1	0	1	0	1	1
376	0	2	?	?	1	?	0	1	0	0	1	0
377	0	?	1	?	0	?	?	0	1	0	1	0
378	0	0	?	1	?	0	1	0	0	0	1	1
379	1	1	?	?	1	?	1	2	2	?	?	?
380	?	?	?	?	?	?	?	?	?	?	?	?
381	?	?	?	?	?	?	?	?	0	?	?	?
382	?	?	?	?	?	?	0	?	?	?	?	?
383	?	?	?	?	?	?	?	?	?	?	?	?
384	?	?	?	?	?	?	0	?	?	?	?	?
385	?	?	?	?	?	?	3	?	?	?	?	?
386	?	?	?	?	?	0	?	?	?	?	?	?
387	?	?	?	?	?	?	?	?	?	?	?	?
388	1	?	?	?	?	?	?	?	?	?	?	?
389	?	?	?	?	0	0	?	?	?	?	?	?
390	?	1	?	?	?	?	?	?	?	?	0	?
391	?	?	?	?	?	?	?	?	?	?	?	?
392	?											
393	Goniopholis_baryglphaeus			?	1	0	0	1	0	?	1	?
394	1	?	0	?	0	?	0	0	1	0	?	0
395	0	1	0	2	1	1	0	?	?	0	1	0
396	0	2	?	?	?	?	?	0	?	0	1	1
397	1	0	0	0	0	0	0	1	0	0	?	0
398	?	0	?	0	0	0	0	0	0	0	0	?
399	?	0	0	0	0	1	0	0	1	1	1	1
400	1	0	0	?	1	0	0	0	?	?	?	?
401	?	1	0	1	0	0	1	0	?	0	1	?

402	0	2	1	0	?	?	?	?	?	0	1	0
403	0	?	1	?	0	?	?	0	1	?	1	0
404	?	0	?	?	0	?	1	0	0	0	1	1
405	1	?	?	?	?	?	1	2	2	?	?	0
406	0	0	0	0	0	0	2	1	?	?	?	?
407	1	0	0	0	0	0	?	?	?	1	?	?
408	?	2	?	?	0	1	0	1	?	?	?	?
409	?	1	0	0	0	?	?	?	?	?	0	1
410	0	0	?	?	?	?	?	0	0	?	0	1
411	?	2	2	0	?	?	?	?	?	?	?	?
412	0	?	?	?	?	0	?	?	?	?	?	?
413	?	?	?	?	0	?	?	?	?	?	?	?
414	?	?	?	?	?	?	?	?	?	?	?	?
415	?	?	?	?	?	?	?	?	?	?	?	?
416	?	?	?	?	?	?	?	?	?	?	?	?
417	?	?	?	?	?	?	?	?	1	?	?	?
418	?											
419	Goniopholis_stovalli		?	1	0	0	1	0	?	1	0	1
420	?	?	?	?	?	0	0	1	0	?	?	0
421	1	0	2	1	1	0	?	?	0	1	0	0
422	2	?	?	?	?	?	0	?	0	1	1	1
423	0	0	0	0	0	0	0	0	0	0	0	?
424	0	?	0	0	0	0	0	0	?	?	?	0
425	0	0	0	0	1	0	0	0	1	1	1	1
426	0	0	?	1	0	0	0	0	0	0	?	?
427	?	0	1	0	0	1	0	?	0	?	?	?
428	2	1	0	?	?	?	?	?	0	1	0	0
429	?	?	?	?	?	?	0	1	1	1	0	0
430	0	?	?	0	0	?	0	0	0	1	1	1
431	?	?	?	?	0	?	2	2	?	?	?	?
432	0	?	?	?	?	?	?	?	?	?	?	?
433	?	0	?	?	?	?	?	?	?	?	?	?
434	?	?	?	0	0	0	?	?	?	?	?	?
435	?	?	?	?	?	?	?	?	?	?	?	?
436	?	?	?	?	?	?	0	0	?	?	?	?
437	?	?	?	?	?	?	?	?	?	?	?	?
438	?	?	?	?	?	?	?	?	?	?	?	?
439	?	?	?	?	?	?	?	?	?	?	?	?
440	?	?	?	?	?	?	?	?	?	?	?	?
441	?	?	?	?	?	?	?	?	?	?	?	?
442	?	?	?	?	?	?	?	?	?	?	?	?
443	?	?	?	?	?	?	?	?	?	?	?	?

444	Goniopholis_simus		?	1	0	0	1	0	?	1	0	1
445	0	0	0	0	?	0	0	1	0	?	0	0
446	?	0	2	1	1	0	0	?	0	?	0	0
447	2	?	?	?	?	?	0	?	0	1	1	1
448	0	0	0	0	0	0	1	0	0	0	0	0
449	0	?	0	0	0	0	0	1	0	0	?	0
450	0	0	0	0	1	0	0	1	1	1	1	1
451	0	0	?	1	0	0	0	0	0	0	?	?
452	?	0	?	0	?	1	0	?	?	?	1	0
453	2	?	?	?	?	?	?	?	0	?	?	?
454	?	?	?	?	?	?	0	1	1	1	?	?
455	0	?	1	?	?	?	?	0	0	?	?	?
456	?	1	?	?	0	1	2	2	?	?	0	0
457	?	0	0	0	?	?	1	?	?	?	0	?
458	?	?	?	?	?	?	?	?	?	?	?	?
459	?	?	?	0	?	0	?	?	?	?	?	?
460	1	0	0	0	0	0	0	?	?	0	1	0
461	0	0	?	0	?	0	0	0	?	?	?	1
462	0	0	?	0	1	3	1	?	?	?	?	0
463	?	?	?	?	0	?	?	?	?	?	?	?
464	?	?	?	?	?	?	?	?	?	?	?	?
465	?	?	?	?	?	?	?	?	?	?	?	?
466	?	?	?	?	?	?	?	?	?	?	?	?
467	?	?	?	?	?	?	?	?	?	?	1	1
468	?	?	0	0	0	2	?	?	?	?	?	?
469	Pietraroiasuchus_ormezzanoi			?	1	0	0	?	?	?	1	?
470	1	?	0	0	2	?	0	0	1	0	0	0
471	0	1	0	0	?	?	0	0	0	2	?	0
472	0	1	0	0	0	0	1	0	0	0	1	1
473	?	0	0	1	0	0	0	1	0	0	?	0
474	?	0	?	0	0	0	0	?	0	0	0	0
475	1	2	0	?	0	0	0	0	?	1	1	?
476	1	0	0	?	1	2	0	?	0	0	0	?
477	?	?	0	1	0	0	1	0	?	0	?	?
478	2	?	0	?	1	?	?	?	?	?	1	0
479	0	?	1	0	0	?	?	?	?	?	?	?
480	?	?	?	?	?	?	?	?	?	?	?	?
481	?	1	?	?	?	0	1	?	?	?	?	0
482	0	1	0	0	0	0	3	1	0	1	?	1
483	?	?	?	2	?	?	?	0	?	?	?	?
484	?	?	?	?	0	1	0	2	0	0	2	0
485	0	0	0	0	0	0	0	0	3	?	?	?
486	?	?	?	?	?	?	?	?	?	?	?	?

487	?	?	?	?	?	?	?	?	?	?	?	?
488	2	?	?	?	?	2	?	?	?	?	?	?
489	1	?	?	?	?	?	?	?	0	2	0	?
490	?	?	0	?	?	0	?	0	0	0	?	0
491	?	?	?	0	?	?	?	?	?	?	?	?
492	?	?	?	?	0	0	?	?	?	?	1	1
493	0	0	?	1	1	0	?	?	1	?	1	?
494	0											
495	Pachycheilosuchus_trinquei			?	?	?	?	?	?	?	?	?
496	?	?	?	?	?	?	?	?	?	?	?	?
497	?	?	?	0	?	?	?	?	?	?	?	?
498	?	1	?	?	?	?	?	?	?	?	?	?
499	?	?	?	?	?	?	?	?	?	?	?	?
500	?	?	?	?	?	?	?	?	?	?	?	?
501	?	?	?	?	?	?	?	?	?	?	?	?
502	?	?	?	?	?	?	?	?	?	?	?	?
503	?	?	?	?	?	?	?	?	?	?	?	?
504	?	?	?	?	?	?	?	?	?	?	?	?
505	?	?	?	?	?	?	?	?	?	?	?	?
506	?	?	?	?	?	?	?	?	?	?	?	?
507	?	?	?	?	?	?	?	?	?	?	?	0
508	0	1	0	0	0	0	3	1	0	1	0	1
509	?	?	?	?	?	?	?	0	?	?	?	?
510	?	?	?	?	?	?	?	2	0	0	2	0
511	0	0	0	0	0	0	0	0	3	?	?	?
512	?	?	?	?	?	?	0	0	0	?	?	?
513	?	?	?	?	?	?	?	?	?	?	0	0
514	2	?	?	1	0	2	?	?	?	?	0	?
515	1	?	?	?	?	?	?	?	0	2	0	?
516	?	?	0	0	0	0	0	0	0	0	?	0
517	?	?	2	0	0	0	0	?	0	0	?	?
518	1	?	?	?	0	?	?	?	?	?	1	1
519	0	0	?	0	0	0	2	1	?	?	?	?
520	0											
521	Alligator_mississippiensis			2	1	0	0	1	0	0	1	0
522	1	1	0	0	2	?	0	?	0	0	?	0
523	0	1	0	2	0	0	0	0	0	0	0	0
524	0	2	?	?	?	?	?	0	?	0	1	1
525	1	1	0	0	0	0	0	2	0	0	0	0
526	?	0	?	0	0	0	0	0	0	1	0	0
527	0	2	0	0	0	1	0	0	1	1	1	1
528	1	0	0	1	1	0	0	0	1	0	0	?

529	?	1	0	1	0	0	1	0	1	0	1	1
530	2	2	1	0	1	?	0	1	0	1	1	2
531	1	?	1	1	0	?	0	0	1	0	1	0
532	0	1	0	1	0	0	1	0	1	0	1	1
533	1	1	1	1	1	0	1	2	2	?	2	0
534	0	0	0	0	0	0	0	0	0	0	?	0
535	1	0	0	2	0	0	0	0	1	1	0	0
536	0	3	0	0	0	1	0	2	?	?	?	?
537	?	0	1	0	0	0	0	0	3	?	0	1
538	0	0	0	?	0	0	0	0	0	0	1	1
539	0	0	0	?	0	1	0	0	0	0	0	0
540	2	0	?	?	?	2	0	0	?	?	0	?
541	1	0	0	?	1	0	0	0	0	2	0	0
542	0	0	0	0	0	0	0	0	0	0	0	0
543	0	0	2	0	0	0	0	?	?	0	1	1
544	1	1	1	1	0	0	0	0	2	0	0	1
545	0	0	1	1	1	0	?	?	1	0	0	?
546	?											
547	Crocodylus_porosus		2	1	0	0	1	0	0	1	0	1
548	1	0	0	2	?	0	0	1	0	?	0	0
549	1	0	2	0	0	0	0	0	0	0	0	0
550	2	?	?	?	?	?	0	?	0	1	1	1
551	1	0	0	0	0	0	2	0	0	0	0	?
552	0	?	0	0	0	0	0	0	1	0	0	0
553	0	0	0	0	0	0	0	0	1	1	1	1
554	0	0	?	1	0	0	0	1	0	0	?	?
555	1	0	1	0	1	1	0	1	0	1	1	2
556	2	1	0	1	?	0	0	0	1	1	2	1
557	?	1	1	0	?	?	0	1	0	1	0	0
558	1	0	1	0	0	1	0	1	0	1	1	1
559	1	1	1	1	0	1	2	2	?	?	0	0
560	0	0	0	0	0	3	0	0	0	?	0	1
561	0	0	2	0	0	0	0	0	1	0	0	0
562	3	0	0	0	1	0	2	?	?	?	?	?
563	0	?	?	?	0	0	0	?	?	0	1	0
564	0	0	?	?	1	0	0	0	0	1	1	?
565	2	0	0	0	?	?	?	0	0	0	0	2
566	0	?	?	?	2	0	0	?	?	0	?	1
567	0	0	?	1	0	0	0	0	?	?	?	0
568	0	0	0	0	0	0	0	0	0	0	0	0
569	0	?	?	0	0	0	?	?	0	1	?	1
570	1	1	1	0	0	0	0	2	0	0	1	0
571	0	?	1	1	0	?	?	?	0	0	?	?

572	Crocodylus_niloticus		2	1	0	0	1	0	0	1	0	1
573	1	0	0	2	?	0	0	1	0	?	0	0
574	1	0	2	0	0	0	0	0	0	0	0	0
575	2	?	?	?	?	?	0	?	0	1	1	1
576	1	0	0	0	0	0	2	0	0	0	0	?
577	0	?	0	0	0	0	0	0	1	0	0	0
578	0	0	0	0	0	0	0	0	1	1	1	1
579	0	0	?	1	0	0	0	1	0	0	?	?
580	1	0	1	0	1	1	0	1	0	1	1	2
581	2	1	0	1	?	0	0	0	1	1	2	1
582	?	1	1	0	?	?	0	1	0	1	0	0
583	1	?	1	0	0	1	0	1	0	1	1	1
584	1	1	1	1	0	1	2	2	?	?	0	0
585	0	0	0	0	0	3	0	0	0	?	0	1
586	0	0	2	0	0	0	0	0	1	0	0	0
587	3	0	0	0	1	0	2	?	?	?	?	?
588	0	0	0	?	0	0	0	?	?	0	1	0
589	0	0	?	0	1	0	0	0	0	1	1	0
590	0	0	?	0	0	0	0	0	0	0	0	2
591	0	?	?	?	2	0	0	?	?	0	?	1
592	0	0	?	1	0	0	0	0	?	?	?	0
593	0	0	0	0	0	0	0	0	0	0	0	0
594	0	2	?	0	0	0	?	?	0	1	?	1
595	1	1	1	0	0	0	0	2	0	0	1	0
596	0	?	1	1	0	?	?	?	0	0	?	?
597	Gavialis_gangeticus		?	0	0	1	1	0	?	1	0	1
598	1	0	0	0	?	0	2	1	0	?	0	0
599	1	0	0	0	0	0	0	?	0	0	0	1
600	2	?	?	?	?	?	0	?	0	1	1	1
601	1	0	0	1	0	0	1	0	0	0	0	0
602	0	?	0	0	0	0	0	0	1	0	0	0
603	0	0	0	0	0	0	0	0	1	1	1	1
604	0	0	?	1	0	0	1	0	0	0	?	?
605	?	0	1	0	0	1	0	1	0	1	1	1
606	2	1	0	1	?	0	0	0	1	1	2	1
607	?	1	1	0	?	?	0	1	0	1	0	0
608	1	?	1	0	0	1	0	1	1	1	1	1
609	1	1	1	1	0	1	2	2	?	?	0	0
610	0	1	0	0	3	3	0	0	0	?	0	1
611	0	0	1	1	1	1	0	0	1	0	0	0
612	3	0	0	0	3	0	1	?	?	?	?	?
613	0	?	?	?	0	0	0	?	?	0	1	0
614	0	1	?	0	1	0	0	0	0	1	1	0

615	0	0	?	0	0	1	0	?	0	0	0	2
616	0	?	?	?	2	0	0	?	?	0	?	1
617	0	0	?	0	0	0	0	?	?	?	?	0
618	0	0	0	0	0	0	0	0	0	0	0	0
619	0	?	?	0	0	0	?	?	0	1	?	1
620	1	1	1	0	0	0	0	2	0	0	1	0
621	0	?	1	1	0	?	?	?	0	0	?	?
622	Susisuchus_anatoceps		?	1	0	0	1	0	?	1	4	1
623	?	?	?	1	?	0	0	1	0	?	0	0
624	?	?	0	0	0	0	?	?	2	?	0	0
625	2	?	?	?	?	?	0	?	0	1	1	1
626	0	0	0	0	0	0	2	0	0	?	0	?
627	0	?	0	0	0	?	0	0	0	0	0	0
628	?	0	0	0	0	0	0	?	1	?	?	?
629	?	0	?	1	0	0	0	0	0	0	?	?
630	?	0	1	0	?	1	0	?	0	1	?	2
631	?	?	?	?	?	?	?	?	?	?	?	?
632	?	?	?	?	?	?	?	?	?	?	?	?
633	?	?	?	?	?	?	?	?	0	?	?	?
634	?	?	?	1	?	?	?	?	?	?	?	?
635	0	0	0	0	?	?	?	?	?	?	?	?
636	?	0	?	?	?	?	?	?	?	?	?	?
637	3	?	?	0	?	0	?	?	?	?	?	?
638	?	?	?	?	?	?	?	?	?	0	?	?
639	?	?	?	?	?	?	0	0	?	?	?	?
640	?	?	?	?	?	?	?	?	?	0	0	0
641	0	?	?	?	0	0	0	?	?	?	?	0
642	0	0	?	0	0	0	?	0	?	?	?	?
643	0	0	?	0	0	0	0	0	0	?	?	?
644	0	?	?	?	?	?	?	?	?	?	?	?
645	?	?	?	?	?	?	?	?	?	?	1	0
646	?	?	1	1	0	?	?	1	?	?	?	?
647	Isisfordia_duncani		?	1	0	0	1	0	?	1	4	1
648	0	0	0	1	?	0	0	1	0	?	0	0
649	1	?	0	?	0	0	?	?	0	0	0	0
650	2	?	?	?	?	?	0	?	0	1	1	1
651	0	0	0	0	0	0	2	0	0	0	0	0
652	0	?	0	0	0	0	0	1	0	?	0	0
653	2	0	0	0	0	0	0	1	1	1	1	1
654	0	0	1	1	0	0	0	0	0	0	?	?
655	?	0	1	0	0	1	0	1	0	1	1	2
656	2	?	?	1	?	0	1	0	1	1	0	0

657	?	1	0	0	?	?	0	1	0	1	0	0
658	0	?	?	0	0	1	0	0	0	1	1	1
659	?	?	?	1	?	1	?	2	?	?	0	0
660	0	0	0	0	?	?	0	?	?	?	?	?
661	?	?	?	?	?	?	?	?	?	?	?	?
662	3	?	?	0	2	0	?	?	?	?	?	?
663	?	?	?	?	?	?	?	?	?	0	1	0
664	0	0	?	0	?	0	0	0	?	1	1	?
665	?	?	?	?	?	?	?	?	?	0	0	1
666	0	?	?	?	1	0	0	?	?	0	?	?
667	0	0	?	0	?	?	0	0	?	?	?	0
668	0	0	0	0	0	0	0	0	0	?	0	?
669	?	?	?	0	0	?	?	?	?	?	?	1
670	1	?	?	0	?	?	?	?	?	0	1	0
671	?	?	1	1	0	?	?	1	?	?	?	?
672	Araripesuchus_patagonicus			?	2	0	0	1	0	?	0	?
673	?	?	?	?	?	?	?	?	?	0	?	0
674	0	1	0	0	0	0	0	?	0	0	0	0
675	0	1	0	0	0	0	0	0	0	0	1	1
676	1	0	0	0	0	0	0	2	0	0	0	0
677	?	0	?	0	0	0	0	0	0	?	0	0
678	0	2	0	0	0	0	0	0	1	1	1	0
679	1	0	0	?	2	0	0	0	0	0	0	?
680	?	1	0	0	0	0	1	0	0	?	0	1
681	2	0	0	0	1	?	0	1	0	0	1	0
682	0	?	0	?	2	?	?	?	1	1	1	?
683	?	0	?	1	0	0	0	0	0	0	?	1
684	1	1	1	1	1	0	0	2	2	?	?	0
685	0	?	?	?	?	?	?	0	?	?	?	?
686	?	?	0	0	0	0	0	?	1	?	?	0
687	?	2	0	0	1	1	0	?	?	?	?	?
688	?	?	?	?	?	?	?	?	?	?	?	?
689	?	?	?	?	?	?	0	0	0	0	1	?
690	?	?	?	?	?	?	?	?	?	?	0	?
691	0	0	?	?	?	0	?	?	?	?	?	?
692	?	?	?	?	?	?	?	?	?	?	?	0
693	1	?	0	0	0	0	0	0	?	0	?	?
694	?	?	2	?	?	?	?	?	?	?	?	?
695	?	?	?	?	?	?	?	?	?	?	?	1
696	?	?	?	0	0	0	2	1	?	?	?	?
697	0											

698	Baurusuchus	?	2	0	0	2	0	?	0	5	0	0
699	0	0	0	?	0	0	0	1	?	1	0	1
700	0	1	0	0	0	?	?	0	0	0	0	2
701	?	?	?	?	?	0	?	0	1	1	1	0
702	0	0	0	0	0	1	1	0	1	0	0	0
703	?	0	1	0	?	0	0	?	?	0	0	?
704	0	0	0	0	0	0	0	?	1	0	1	2
705	0	1	2	0	0	0	0	0	0	?	?	?
706	0	1	?	0	1	0	0	?	?	1	1	0
707	?	?	1	?	1	?	0	0	1	0	?	?
708	?	?	1	?	?	0	1	0	?	?	?	0
709	?	?	0	?	0	0	0	0	?	1	1	1
710	?	?	1	?	0	1	2	?	?	0	0	?
711	?	0	1	1	0	0	1	0	?	0	0	?
712	0	1	0	0	0	0	1	?	?	0	?	2
713	1	0	1	0	0	3	?	?	?	?	?	0
714	1	0	1	?	0	?	?	?	1	1	0	0
715	0	?	?	1	0	0	0	0	0	1	?	2
716	2	0	2	?	?	?	?	?	0	?	?	?
717	?	?	?	?	?	?	?	?	?	?	?	?
718	?	?	?	?	?	0	?	?	?	?	?	?
719	?	0	?	?	?	?	0	?	?	?	?	?
720	?	?	?	?	?	?	?	?	?	?	?	?
721	?	?	?	?	?	?	?	?	?	?	?	?
722	?	?	?	?	?	?	?	?	?	?	?	
723	Mariliasuchus_amarali			?	2	?	0	2	0	?	0	5
724	0	?	0	?	0	?	0	0	0	1	?	1
725	0	1	0	0	0	0	?	?	?	?	1	0
726	0	2	?	?	0	?	?	0	?	0	1	1
727	1	0	0	0	1	0	0	2	0	0	1	0
728	0	0	?	?	0	0	?	0	0	?	?	0
729	0	2	0	0	0	0	0	0	?	?	1	0
730	1	1	0	?	2	0	1	1	0	0	0	?
731	?	?	0	0	?	0	1	0	?	?	?	?
732	1	?	?	?	1	?	1	?	0	0	1	?
733	?	?	?	?	1	?	?	0	?	?	?	?
734	?	0	?	?	0	?	?	0	0	0	?	?
735	?	?	?	1	0	?	?	?	?	?	?	0
736	0	?	?	?	?	0	0	0	0	0	?	0
737	0	?	0	?	0	0	0	1	1	?	?	0
738	1	2	?	?	2	0	1	3	?	?	?	?
739	?	?	?	?	?	?	?	?	?	?	0	?
740	1	1	0	?	?	0	0	0	0	0	1	0

741	?	0	0	?	0	?	?	?	?	?	?	?
742	?	?	?	?	?	?	?	?	?	?	?	?
743	?	?	?	?	?	?	?	?	?	?	?	?
744	?	?	?	?	?	?	?	?	?	?	?	?
745	?	?	?	?	?	?	?	?	?	?	?	?
746	?	?	?	?	?	?	?	?	?	?	?	?
747	?	?	?	?	?	?	?	?	?	?	?	?
748	?											
749	Notosuchus_terrestris		?	2	?	0	2	0	?	0	5	0
750	?	0	?	0	?	0	0	0	1	?	1	0
751	1	0	0	0	0	0	?	1	?	0	0	0
752	1	0	0	0	0	0	0	1	0	1	1	1
753	0	0	0	0	0	0	2	0	0	1	0	0
754	0	?	0	0	?	0	0	0	?	?	0	0
755	0	0	0	0	0	0	0	1	1	1	0	1
756	?	0	?	2	0	0	0	?	?	?	?	?
757	0	?	0	?	0	1	0	0	?	1	1	1
758	0	0	0	1	?	1	?	0	0	1	0	0
759	?	0	?	1	?	?	0	1	?	?	1	0
760	0	?	?	0	0	0	0	0	0	1	1	1
761	?	?	1	0	?	0	1	?	?	?	0	0
762	?	?	?	?	0	0	0	0	0	?	0	0
763	?	0	0	0	0	0	1	1	1	0	0	1
764	2	?	?	1	0	1	3	?	?	?	?	?
765	0	?	?	?	?	?	?	?	?	0	?	1
766	?	0	?	?	0	0	0	0	0	1	0	?
767	0	0	?	0	?	?	?	?	1	?	0	0
768	?	?	?	?	0	?	?	?	?	1	?	?
769	?	?	?	0	?	?	?	0	?	?	0	1
770	1	1	?	0	0	0	0	?	0	?	?	?
771	0	2	?	?	?	?	?	?	?	?	?	1
772	1	?	?	?	?	?	?	?	?	0	1	?
773	?	?	0	0	0	2	?	?	?	?	?	?
774	Adamantinasuchus_navae			?	2	?	0	2	0	?	0	5
775	1	?	0	0	0	?	0	0	0	1	?	?
776	0	?	0	0	0	0	?	?	?	1	?	0
777	0	2	?	?	0	?	?	0	?	0	1	1
778	?	0	0	0	?	?	?	2	?	0	1	0
779	0	0	?	?	?	0	?	0	?	?	?	0
780	0	?	0	0	0	0	0	0	?	?	1	0
781	?	?	0	?	2	0	1	1	0	0	0	?
782	?	?	0	0	0	0	1	0	?	?	?	?

783	?	?	0	0	?	?	?	?	?	0	1	?
784	?	?	?	?	?	?	?	?	?	?	?	?
785	?	?	?	?	?	?	?	?	?	0	?	?
786	?	?	?	?	?	?	?	?	?	?	?	0
787	0	?	?	?	?	?	?	0	?	?	?	?
788	?	?	0	?	0	0	0	1	?	?	?	0
789	?	?	?	?	2	0	0	3	?	?	?	?
790	?	?	?	?	?	?	?	?	?	?	0	?
791	1	1	0	?	?	0	0	0	0	0	1	0
792	?	0	0	?	?	?	?	?	?	?	?	?
793	?	?	?	?	?	?	?	?	?	?	?	?
794	?	?	?	?	?	?	?	0	?	?	?	?
795	?	?	?	?	?	?	?	?	?	0	?	?
796	?	?	?	?	?	?	?	?	?	?	?	?
797	?	?	?	?	0	?	?	?	?	?	?	?
798	?	?	?	?	?	?	?	?	?	?	?	?
799	?											
800	Sphagesaurus_huenei		?	2	?	0	2	0	2	0	5	1
801	?	0	0	0	?	0	0	0	1	?	1	0
802	1	0	0	0	0	0	?	?	0	0	0	0
803	2	?	?	0	0	0	0	1	0	1	0	0
804	?	0	0	0	0	0	2	0	0	1	0	0
805	0	?	?	?	?	?	0	0	0	?	?	?
806	?	?	0	?	?	?	?	?	?	?	?	?
807	?	?	?	2	0	1	1	0	0	0	?	?
808	?	?	0	0	0	1	0	?	?	1	1	1
809	0	0	0	1	4	1	?	0	0	1	?	?
810	?	?	?	?	?	?	?	?	?	?	?	?
811	?	?	?	?	?	0	0	?	?	?	?	?
812	?	?	?	?	?	?	?	?	?	?	?	?
813	?	?	?	?	?	?	?	?	?	?	?	?
814	?	?	?	?	?	?	?	?	?	?	?	?
815	?	?	?	2	0	0	3	?	?	?	?	?
816	?	?	?	?	?	?	?	?	?	0	?	1
817	1	?	?	?	?	0	0	1	0	1	1	?
818	?	?	?	?	?	?	?	?	?	?	?	?
819	?	?	?	?	?	?	?	?	?	?	?	?
820	?	?	?	?	?	?	?	?	?	?	?	?
821	?	?	?	?	?	?	?	?	?	?	?	?
822	?	?	?	?	?	?	?	?	?	?	?	?
823	?	?	?	?	?	?	?	?	?	?	?	?
824	?	?	?	?	?	?	?	?	?	?	?	?

825	Caipirasuchus_montealtensis			?	2	?	0	2	0	?	0	5
826	1	?	0	0	0	?	0	0	0	1	0	1
827	0	1	0	0	0	0	0	0	1	0	0	0
828	0	1	0	0	0	0	0	0	1	0	1	0
829	0	?	0	0	0	0	0	2	0	0	1	0
830	0	0	?	0	0	0	0	0	0	0	0	0
831	0	0	0	0	0	0	0	0	?	1	?	?
832	1	1	0	1	2	0	1	1	0	0	0	?
833	?	0	0	0	0	0	1	0	?	?	1	1
834	0	0	0	0	1	4	1	?	0	0	1	0
835	0	?	0	?	1	?	?	0	1	1	?	?
836	?	0	?	?	?	?	?	?	?	?	?	?
837	?	?	?	1	0	?	?	?	?	?	?	0
838	0	?	0	0	0	?	?	0	0	0	?	0
839	0	?	0	0	0	0	0	1	?	?	?	0
840	?	?	?	?	?	0	0	3	?	?	?	?
841	?	0	?	?	?	?	0	?	?	?	0	?
842	1	1	0	?	?	0	0	0	1	0	1	1
843	?	0	2	?	?	?	?	0	?	?	?	?
844	?	?	?	?	?	?	?	?	?	?	?	?
845	?	?	0	?	?	?	?	?	0	?	?	?
846	?	?	?	0	0	0	0	0	0	?	?	?
847	?	?	?	?	?	?	?	?	?	?	?	?
848	?	?	?	?	?	0	?	?	?	?	?	1
849	?	?	?	0	0	0	?	1	?	?	?	?
850	0											
851	Hamadasuchus_rebouli			?	2	0	0	1	0	?	0	0
852	1	0	0	0	0	?	0	0	0	0	?	?
853	0	1	1	2	0	0	0	?	0	0	1	0
854	0	1	0	0	0	0	1	0	1	0	1	1
855	1	0	0	0	0	0	0	2	0	0	0	0
856	0	0	?	0	0	0	0	0	0	0	1	?
857	0	1	0	0	0	0	0	0	1	1	1	1
858	1	0	0	1	2	0	0	0	1	0	0	?
859	?	1	0	1	1	0	1	0	1	?	0	1
860	1	1	1	0	1	?	0	1	0	0	1	0
861	0	?	0	?	2	?	0	0	1	0	1	?
862	?	0	?	?	0	?	0	0	0	0	0	1
863	1	1	?	1	1	0	0	3	2	?	?	0
864	0	0	0	0	1	?	?	?	1	0	?	0
865	?	?	0	?	?	?	?	?	1	?	?	0
866	?	?	?	?	1	1	0	2	?	?	1	?
867	?	0	1	1	1	?	0	0	?	?	0	1

868	0	0	0	?	?	1	0	0	0	0	0	1
869	?	2	2	0	2	?	?	?	?	?	?	?
870	?	?	?	?	?	?	?	?	?	?	?	?
871	?	?	?	?	?	?	?	?	?	?	?	?
872	?	?	?	?	?	?	?	?	?	?	?	?
873	?	?	?	?	?	?	?	?	?	?	?	?
874	?	?	?	?	?	?	?	?	?	?	?	?
875	?	?	?	?	?	?	?	?	?	?	?	?
876	?											
877	Mahajangasuchus_insignis			?	1	0	0	1	0	?	?	0
878	1	?	?	?	?	?	?	?	?	?	?	0
879	0	?	1	2	0	0	?	?	0	2	?	0
880	0	1	0	0	?	0	1	0	1	0	1	1
881	1	?	0	2	1	0	0	2	0	0	0	0
882	1	0	?	0	0	0	0	0	?	?	1	?
883	0	0	0	0	0	0	0	0	1	1	1	1
884	1	1	0	?	1	0	0	0	0	0	0	?
885	?	?	0	1	0	0	1	0	?	?	?	1
886	1	?	?	?	?	?	?	?	?	?	1	2
887	1	?	1	?	0	?	?	?	?	?	1	0
888	?	0	?	?	0	0	0	0	?	?	?	?
889	?	1	?	?	?	?	0	?	2	?	?	0
890	0	?	?	?	1	?	?	0	1	0	?	0
891	?	?	0	?	3	1	1	0	1	?	?	0
892	?	3	0	?	?	0	0	3	?	?	?	?
893	?	?	?	?	?	?	?	?	?	?	1	1
894	0	0	0	?	?	1	?	0	0	?	0	1
895	?	2	2	0	2	?	?	?	?	?	?	?
896	0	0	?	?	?	0	?	?	?	?	?	?
897	?	?	?	0	?	0	0	0	0	?	?	?
898	1	0	0	?	0	0	0	0	?	0	?	?
899	?	?	2	?	0	0	0	?	?	0	?	?
900	1	?	?	?	0	?	?	?	?	?	?	?
901	?	?	?	?	?	?	?	?	?	?	?	?
902	?											
903	Montealtosuchus_arrudacamposi				?	2	0	0	1	0	0	0
904	5	1	0	0	0	0	?	0	0	0	0	?
905	0	0	?	?	2	0	0	0	?	0	0	?
906	0	0	1	0	0	0	0	1	0	0	0	1
907	1	1	0	0	0	0	0	0	2	0	0	0
908	0	0	0	?	0	0	0	0	0	0	0	1
909	?	0	0	0	0	0	0	0	0	1	1	1

910	1	1	0	0	?	2	0	0	0	0	0	0
911	?	?	0	0	1	0	0	1	0	?	?	?
912	1	1	?	0	1	1	?	0	1	0	0	1
913	0	0	?	0	?	2	?	?	0	1	?	1
914	0	?	0	?	?	0	?	0	0	0	0	?
915	?	?	1	?	?	?	?	0	1	2	?	?
916	0	0	0	0	0	1	0	0	0	1	0	?
917	0	?	?	0	1	3	1	1	0	1	?	?
918	0	1	3	0	0	0	1	0	2	?	?	0
919	?	?	0	0	0	0	?	0	0	?	?	?
920	1	0	0	0	?	?	1	0	0	0	?	0
921	1	?	2	2	0	2	?	?	?	?	?	?
922	?	?	?	?	?	?	?	?	?	?	?	?
923	?	?	?	?	?	?	?	?	?	?	?	?
924	?	?	?	?	?	?	?	?	?	?	?	?
925	?	?	?	?	?	?	?	?	?	?	?	?
926	?	?	?	?	?	?	?	?	?	?	?	?
927	?	?	?	?	?	?	?	?	?	?	?	?
928	?	?										
929	Sebecus_icaeorhinus		?	2	0	0	1	0	?	?	0	1
930	?	?	?	0	?	0	0	0	0	?	0	0
931	1	1	2	0	0	?	?	0	?	1	0	0
932	2	?	?	?	?	?	0	0	0	1	1	1
933	0	0	0	0	0	0	2	0	0	0	0	?
934	0	?	0	0	0	0	0	?	?	?	?	0
935	0	0	0	0	0	0	?	1	1	1	1	?
936	?	0	?	2	0	0	0	1	0	0	?	?
937	1	0	1	1	?	1	0	?	?	?	?	1
938	?	?	?	?	?	?	?	?	0	1	0	0
939	?	0	?	2	?	?	0	1	?	?	1	0
940	0	?	?	0	0	0	0	0	0	1	1	1
941	?	?	?	?	?	0	2	?	?	?	?	?
942	?	?	?	?	0	0	0	?	?	?	?	?
943	?	0	?	?	?	?	?	?	?	?	0	?
944	?	0	0	1	0	0	2	?	?	?	?	?
945	?	?	?	?	?	?	?	?	?	0	2	0
946	0	0	?	?	1	0	0	0	?	0	1	?
947	2	2	0	2	?	?	?	?	?	?	?	?
948	?	?	?	?	?	?	?	?	?	?	?	?
949	?	?	?	?	?	?	?	?	2	?	?	?
950	?	?	?	?	?	?	?	?	?	?	?	?
951	?	?	?	?	?	?	?	?	?	?	?	?

952	1	?	?	?	?	?	?	?	?	?	?	?
953	?	?	?	?	?	?	?	?	?	?	?	?
954	Uberabasuchus_terrificus			?	2	0	0	1	0	?	0	5
955	1	0	0	0	0	?	0	0	0	0	?	0
956	0	?	1	2	0	0	?	?	0	0	?	0
957	0	1	0	0	0	0	1	0	0	0	1	1
958	1	0	0	0	0	0	0	2	0	0	0	0
959	0	0	?	0	0	0	?	0	0	0	1	?
960	0	1	0	0	0	0	0	0	?	?	1	1
961	1	0	0	?	2	0	0	0	0	0	0	?
962	?	1	0	1	0	0	1	0	?	?	?	?
963	1	0	?	?	?	?	?	?	?	0	1	?
964	?	?	?	?	2	?	?	0	1	0	?	?
965	?	0	?	?	0	?	?	0	0	0	?	?
966	?	?	?	?	1	?	0	1	?	?	?	0
967	0	0	0	0	1	0	0	0	1	0	?	0
968	?	?	0	1	1	0	?	?	1	1	?	0
969	?	3	0	0	0	1	0	2	?	?	?	?
970	?	?	?	?	?	?	?	?	?	?	1	1
971	0	0	0	?	?	1	0	0	0	?	0	1
972	?	2	2	0	2	?	?	?	?	?	?	?
973	?	?	?	?	?	?	?	?	?	?	?	?
974	?	?	?	?	?	?	?	?	?	?	?	?
975	?	?	?	?	?	?	?	?	?	?	?	?
976	?	?	?	?	?	?	?	?	?	?	?	?
977	?	?	?	?	?	?	?	?	?	?	?	?
978	?	?	?	?	?	?	?	?	?	?	?	?
979	?											
980	Pholidosaurus_sp._(DORCM_G.27)				1	1	?	0	2	?	?	?
981	?	?	?	?	?	?	?	?	0	?	0	0
982	0	1	1	?	0	0	0	?	0	?	0	0
983	0	?	2	1	0	?	0	0	0	?	0	1
984	1	1	0	0	0	0	0	0	1	0	0	1
985	0	0	0	0	0	0	0	0	1	0	1	0
986	0	0	0	0	0	0	1	0	0	1	0	1
987	1	1	1	0	1	1	1	1	1	?	?	?
988	?	?	2	0	0	0	?	1	?	?	0	?
989	1	1	2	?	?	?	?	?	?	?	?	?
990	?	?	?	?	?	?	0	1	0	0	0	?
991	?	?	0	?	?	?	?	?	?	?	?	?
992	?	?	?	?	?	?	?	?	?	?	?	?
993	?	?	?	?	?	?	?	?	?	?	?	?

994	?	?	?	?	?	?	?	?	?	?	?	?
995	?	?	?	?	?	?	?	?	?	?	?	?
996	?	?	?	?	?	?	?	?	?	?	?	0
997	?	?	?	?	?	0	?	?	?	?	?	1
998	?	?	?	?	?	?	?	3	?	?	?	?
999	?	?	?	?	?	?	?	?	?	?	?	?
1000	?	?	?	?	?	?	?	?	?	?	?	?
1001	?	?	?	?	?	?	?	?	?	?	?	?
1002	?	?	?	?	?	?	?	?	?	?	?	?
1003	?	?	?	?	?	?	?	?	?	?	?	?
1004	?	?	?	?	?	?	?	?	?	?	?	?
1005	?	?										
1006	Pholidosaurus_purbeckensis_holotype					?	1	0	0	3	?	?
1007	?	?	?	?	?	?	?	?	?	?	?	0
1008	0	0	0	1	?	0	0	0	1	1	?	0
1009	0	0	?	2	0	0	?	0	0	0	?	1
1010	1	1	1	0	0	0	0	0	0	2	0	0
1011	0	0	0	0	0	0	0	0	0	1	0	1
1012	0	0	0	0	0	0	0	1	0	0	0	1
1013	1	1	1	1	0	1	1	1	1	1	?	?
1014	?	?	?	2	1	1	0	?	1	?	?	0
1015	?	1	1	0	?	?	?	?	?	?	?	?
1016	?	?	?	?	?	?	?	0	1	0	0	0
1017	1	?	?	0	?	1	?	?	?	?	?	?
1018	1	1	?	?	?	?	?	?	1	?	1	?
1019	?	?	?	?	?	?	?	?	?	?	?	?
1020	?	?	?	?	?	?	?	?	?	?	?	?
1021	?	?	?	?	?	?	?	?	?	?	?	?
1022	?	?	?	?	?	?	?	?	?	?	?	?
1023	?	?	?	?	?	?	?	?	?	?	?	?
1024	?	?	?	?	?	?	?	?	?	?	?	?
1025	?	?	?	?	?	?	?	?	?	?	?	?
1026	?	?	?	?	?	?	?	?	?	?	?	?
1027	?	?	?	?	?	?	?	?	?	?	?	?
1028	?	?	?	?	?	?	?	?	?	?	?	?
1029	?	?	?	?	?	?	?	?	?	?	?	?
1030	?	?	?	?	?	?	?	?	?	?	?	?
1031	?	?	?									
1032	Pholidosaurus_schaumbergensis				?	0	0	0	1	0	?	?
1033	?	?	?	?	?	?	?	?	?	?	0	?
1034	0	0	1	?	0	0	0	1	0	0	0	0
1035	0	0	2	?	?	0	0	0	0	?	0	1

1036	1	1	0	0	0	0	0	0	2	0	0	?
1037	0	?	0	?	0	0	0	0	0	?	1	0
1038	?	0	0	0	?	?	1	0	0	1	1	1
1039	1	1	0	0	?	1	0	0	0	0	0	0
1040	?	?	?	?	1	0	1	1	0	?	0	?
1041	?	1	2	?	?	1	?	0	0	0	1	1
1042	0	0	?	0	1	0	0	?	?	?	?	?
1043	?	?	0	?	?	?	?	1	0	0	?	?
1044	1	1	?	?	?	1	?	?	2	2	?	?
1045	0	0	0	1	0	0	1	?	?	?	?	?
1046	?	?	?	?	1	?	?	?	?	?	0	?
1047	?	?	2	?	?	?	?	0	?	?	?	?
1048	?	?	?	?	?	?	?	0	0	?	?	0
1049	?	?	0	?	?	0	?	0	0	0	?	?
1050	?	?	0	0	?	?	0	3	?	?	?	?
1051	?	0	?	?	?	?	0	0	0	?	?	?
1052	?	?	?	?	?	?	?	?	?	?	?	?
1053	?	?	?	?	?	?	0	?	?	0	?	?
1054	0	?	0	2	?	?	?	?	?	?	?	?
1055	?	?	?	?	?	?	?	?	?	?	?	?
1056	1	1	?	?	0	0	?	?	?	?	?	?
1057	?	?										
1058	Vectisuchus_leptognathus			?	0	0	0	1	0	?	1	0
1059	1	?	?	?	?	?	0	0	1	0	?	0
1060	0	1	0	2	0	0	1	?	?	0	0	0
1061	0	2	?	?	?	?	?	0	?	0	1	1
1062	?	0	0	0	0	0	0	1	0	0	?	0
1063	0	0	?	0	0	0	0	0	?	1	?	?
1064	1	0	0	0	0	?	?	?	0	0	?	?
1065	1	0	0	?	?	0	0	0	0	0	0	?
1066	?	?	0	?	0	1	1	0	?	0	0	?
1067	1	?	?	?	1	?	0	1	0	1	1	0
1068	0	?	0	?	0	?	?	0	1	0	?	?
1069	?	0	?	?	0	?	1	0	0	?	?	?
1070	?	?	?	?	1	?	1	?	2	?	?	?
1071	?	0	1	0	0	1	?	0	?	?	?	?
1072	?	?	0	1	?	?	?	?	0	?	?	?
1073	?	1	?	?	?	?	0	?	?	?	?	?
1074	?	?	?	?	?	?	?	?	?	?	?	?
1075	?	?	?	?	?	?	?	0	0	?	?	?
1076	?	?	?	?	?	?	?	?	?	?	?	?
1077	?	?	?	?	?	?	?	?	?	?	?	?
1078	?	?	?	?	?	?	?	?	?	?	?	?

1079	?	?	?	?	?	?	?	?	?	?	?	?
1080	?	?	?	?	?	?	?	?	?	?	?	?
1081	?	?	?	?	?	?	?	?	?	?	?	?
1082	?	?	?	?	?	?	?	?	1	?	?	?
1083	?											
1084	Sarcosuchus_imperator			?	1	0	0	1	0	?	1	0
1085	1	1	1	1	1	?	0	0	1	0	?	0
1086	0	1	?	0	0	0	1	?	0	0	0	0
1087	0	2	?	?	?	?	?	0	?	0	1	1
1088	1	0	0	0	0	0	0	0	0	0	0	0
1089	?	0	?	0	0	0	0	0	0	1	0	?
1090	0	0	0	0	0	2	0	0	1	1	1	1
1091	1	0	0	?	1	0	0	0	0	0	0	?
1092	?	?	?	1	0	1	1	0	?	?	0	1
1093	1	?	?	?	1	?	0	1	0	?	1	0
1094	0	?	0	?	2	?	?	0	1	0	1	?
1095	?	0	?	1	?	0	1	0	0	?	0	1
1096	1	1	1	?	1	?	1	2	?	?	?	0
1097	0	0	1	0	0	?	?	0	?	?	?	?
1098	?	?	0	?	1	0	1	0	1	0	?	?
1099	?	2	0	0	0	4	0	0	?	?	1	?
1100	?	0	0	0	0	?	0	0	?	?	0	1
1101	0	0	0	?	?	0	0	0	0	0	1	1
1102	?	0	0	?	0	?	?	?	?	?	?	0
1103	0	?	?	?	?	0	?	?	?	?	?	?
1104	?	?	?	?	0	?	?	?	?	?	?	0
1105	1	0	?	?	?	0	0	0	0	?	?	?
1106	?	?	2	?	0	0	0	?	?	0	?	?
1107	?	?	?	?	?	?	?	?	?	?	?	1
1108	1	?	?	0	0	0	2	1	?	?	?	?
1109	?											
1110	Terminonaris_robusta		?	0	0	0	1	0	?	1	0	1
1111	1	1	1	1	?	0	0	1	0	?	?	0
1112	1	?	0	0	0	1	?	0	0	0	0	0
1113	2	?	?	?	?	?	0	?	0	1	1	1
1114	0	0	0	0	0	0	0	0	0	0	0	?
1115	0	?	0	0	0	0	0	0	1	0	?	0
1116	0	0	?	0	2	0	0	1	1	1	1	1
1117	1	0	?	1	0	0	0	0	0	0	?	?
1118	?	1	1	1	?	1	0	?	?	?	?	1
1119	2	?	?	1	?	0	0	0	?	1	0	0
1120	?	0	?	2	?	?	0	1	0	1	?	?

1121	0	?	?	?	0	1	0	0	1	0	?	?
1122	1	?	?	1	?	1	?	2	?	?	0	0
1123	0	1	0	0	1	?	0	?	?	?	?	?
1124	?	0	?	0	0	0	0	?	?	?	?	?
1125	1	?	?	0	?	0	?	?	?	?	?	?
1126	0	0	1	0	?	0	0	?	?	0	1	0
1127	0	?	?	?	0	0	0	0	?	1	1	?
1128	0	0	?	0	?	?	?	?	?	?	0	0
1129	?	?	?	?	0	?	?	?	?	?	?	?
1130	?	0	?	0	?	?	?	0	2	?	0	1
1131	0	0	?	0	0	0	0	?	0	?	?	?
1132	0	2	?	0	0	0	?	?	0	?	?	1
1133	1	?	?	0	0	?	0	?	?	?	1	1
1134	?	?	0	0	0	2	1	1	?	?	?	?
1135	Oceanosuchus_boecensis			?	0	0	?	1	0	?	1	0
1136	1	1	1	1	0	?	0	0	1	0	?	?
1137	0	1	?	0	0	0	?	?	?	0	1	0
1138	?	2	?	?	?	?	?	0	?	0	1	1
1139	?	0	0	0	0	0	0	0	0	0	?	?
1140	0	0	?	0	0	0	0	0	0	1	0	?
1141	0	0	0	0	0	2	0	0	1	1	?	?
1142	1	0	0	1	1	0	0	0	?	?	?	?
1143	?	?	?	?	0	?	1	0	?	?	?	?
1144	?	?	?	?	1	?	?	?	?	1	1	?
1145	?	?	?	?	?	?	0	0	1	0	1	0
1146	0	0	?	1	?	?	?	0	0	1	?	?
1147	?	1	?	?	1	0	?	?	?	?	?	0
1148	0	0	1	0	0	1	?	1	?	?	?	?
1149	?	?	0	1	?	?	?	?	?	0	1	?
1150	?	?	?	?	0	2	0	1	?	?	?	?
1151	?	?	?	?	?	?	?	?	?	?	1	1
1152	0	0	?	?	?	0	?	0	0	?	1	1
1153	?	0	0	?	0	?	?	?	?	1	?	?
1154	0	0	?	?	?	0	0	0	?	?	?	?
1155	?	?	?	?	?	0	0	?	?	?	?	?
1156	?	?	?	?	?	?	?	?	?	?	?	?
1157	?	?	?	?	0	0	0	?	?	0	?	?
1158	?	?	?	?	?	0	?	?	?	?	?	1
1159	1	?	?	0	0	0	2	1	?	?	?	?
1160	?											
1161	Elosuchus_cherifiensis			?	0	0	0	1	0	1	1	0
1162	1	0	1	1	0	?	0	0	1	0	?	0

1163	0	1	?	2	0	0	1	?	?	0	0	0
1164	?	?	?	?	?	?	?	0	?	0	1	1
1165	?	0	0	0	2	0	0	1	0	0	?	0
1166	0	0	?	0	0	0	0	0	0	1	0	?
1167	1	0	0	0	0	0	0	0	1	0	1	1
1168	1	0	0	?	1	0	0	0	?	?	?	?
1169	?	?	0	?	?	?	1	0	?	?	0	?
1170	0	0	?	?	1	?	0	0	0	1	1	0
1171	0	?	0	?	2	?	?	0	?	1	1	?
1172	?	0	?	1	0	0	1	0	0	1	?	?
1173	?	1	1	?	1	?	1	?	?	?	?	?
1174	?	0	1	0	0	?	?	0	0	0	?	0
1175	?	?	0	1	?	?	?	0	?	?	?	?
1176	0	?	0	0	0	2	0	1	?	?	1	?
1177	?	0	0	0	?	0	0	0	?	?	?	1
1178	0	0	?	?	?	0	0	0	0	0	1	?
1179	?	?	?	?	?	?	?	?	?	?	?	?
1180	0	?	?	?	?	?	0	0	?	?	?	?
1181	?	?	?	?	?	?	?	?	?	?	?	?
1182	?	?	?	?	?	?	?	?	?	?	?	?
1183	?	?	?	?	?	?	?	?	?	?	?	?
1184	?	?	?	?	?	?	?	?	?	?	?	1
1185	1	?	?	0	0	0	?	?	?	?	?	?
1186	?											
1187	Chalawan_thailandicus			?	1	0	0	?	?	?	1	?
1188	1	1	1	1	1	?	0	0	?	0	?	0
1189	?	?	?	0	?	0	1	?	?	?	?	?
1190	?	?	?	?	?	?	?	?	?	?	1	1
1191	?	?	0	0	0	0	0	?	0	?	?	?
1192	?	?	?	?	?	?	?	?	0	1	?	?
1193	?	?	0	?	?	?	?	?	?	?	?	?
1194	1	0	0	?	?	?	?	?	?	?	?	?
1195	?	?	?	?	?	?	?	?	?	?	?	?
1196	?	?	?	?	1	?	?	?	?	?	?	?
1197	?	?	?	?	?	?	?	?	?	?	?	?
1198	?	?	?	?	?	?	?	?	?	?	?	?
1199	?	1	?	?	?	?	?	?	?	1	?	?
1200	?	?	1	0	0	?	?	?	?	?	?	?
1201	?	?	?	1	?	?	?	?	?	?	?	?
1202	?	?	?	?	0	4	0	0	0	0	1	0
1203	0	0	1	?	0	0	0	0	0	?	?	
1204	0	?	?	?	?	?	?	?	?	?	?	?
1205	?	?	?	?	?	?	?	?	?	?	?	?

1206	?	?	?	?	?	?	?	?	?	?	?	?
1207	?	?	?	?	?	?	?	?	?	?	?	?
1208	?	?	?	?	?	?	?	?	?	?	?	?
1209	?	?	?	?	?	?	?	?	?	?	?	?
1210	?	?	?	?	?	?	?	?	?	?	?	?
1211	?	?	?	?	?	?	?	?	?	?	?	?
1212	?											
1213	Elosuchus_felixi		?	?	?	?	?	?	?	?	?	?
1214	?	?	?	?	?	?	?	?	?	?	?	?
1215	?	?	2	?	?	?	?	?	?	?	?	?
1216	?	?	?	?	?	?	?	?	?	?	?	?
1217	?	?	?	?	?	?	?	?	?	?	?	?
1218	?	?	?	?	?	?	?	?	?	?	?	?
1219	?	?	?	?	?	?	?	?	?	?	?	?
1220	?	?	?	?	?	?	?	?	?	?	?	?
1221	?	?	?	?	?	?	?	?	?	?	?	?
1222	?	?	?	?	?	?	?	?	?	?	?	?
1223	?	?	?	?	?	?	?	?	?	?	?	?
1224	?	?	?	?	?	?	?	?	?	?	?	?
1225	?	?	?	?	?	?	?	?	?	?	?	?
1226	0	0	1	0	?		?	0	0	0	0	?
1227	?	0	1	?	?	?	?	?	?	?	?	?
1228	?	?	?	?	?	?	2	?	?	1	0	0
1229	0	1	1	1	0	0	0	1	?	?	?	?
1230	?	?	?	?	?	?	?	?	?	?	?	?
1231	?	?	?	?	?	?	?	?	?	?	?	?
1232	?	?	?	?	?	?	?	?	?	?	?	?
1233	?	?	?	?	?	?	?	?	?	?	?	?
1234	?	?	?	?	?	?	?	?	?	?	?	?
1235	?	?	?	?	?	?	?	?	?	?	?	?
1236	?	?	?	?	?	?	?	?	?	?	?	?
1237	?	?	?	?	?	?	?	?	?	?	?	?
1238	Arambourgisuchus_khouribgaensis				?	0	0	0	1	0	?	1
1239	0	1	0	0	0	0	?	0	0	1	0	?
1240	?	0	1	?	0	0	0	?	?	?	0	0
1241	0	0	2	?	?	?	?	?	0	?	0	1
1242	1	?	0	0	1	0	0	0	0	0	0	?
1243	0	0	0	?	0	0	0	0	2	0	0	0
1244	?	0	1	0	?	0	2	?	0	?	1	?
1245	?	1	2	0	?	1	0	0	0	?	?	?
1246	?	?	?	0	?	1	1	1	?	?	?	?
1247	?	0	?	?	?	1	?	0	0	0	?	1

1248	0	?	?	1	?	?	?	?	3	?	?	?
1249	0	?	0	?	?	0	0	1	0	0	1	?
1250	?	?	?	?	?	1	?	0	?	?	?	?
1251	?	?	0	0	0	0	?	?	?	?	0	?
1252	0	?	?	0	?	?	?	?	0	?	?	?
1253	?	?	?	?	?	1	1	0	?	?	?	?
1254	?	?	?	1	1	1	?	1	?	?	?	?
1255	?	?	0	?	?	?	?	0	0	0	?	1
1256	1	?	0	0	?	0	?	?	?	?	?	?
1257	?	?	?	?	?	?	?	?	?	?	?	?
1258	?	?	?	?	?	?	?	?	?	?	?	?
1259	?	?	?	?	?	?	?	?	?	?	?	?
1260	?	?	?	?	?	?	?	?	?	?	?	?
1261	?	?	?	?	?	?	?	?	?	?	?	?
1262	?	?	?	?	?	?	?	?	?	?	?	?
1263	?	?										
1264	Atlantosuchus_coupatezi			?	0	0	0	1	?	?	1	?
1265	1	?	?	?	0	?	0	0	1	0	?	?
1266	0	1	?	0	0	0	?	?	?	0	0	0
1267	0	?	?	?	?	?	?	0	?	0	1	1
1268	?	0	0	1	0	0	0	0	0	0	0	0
1269	0	0	?	0	0	0	?	0	0	?	0	?
1270	?	?	0	?	0	?	?	0	0	?	?	?
1271	1	2	0	?	1	?	?	?	?	?	?	?
1272	?	?	?	?	0	0	1	?	?	?	?	?
1273	0	?	?	?	?	?	?	?	?	?	?	?
1274	?	?	?	?	?	?	?	3	1	0	?	?
1275	?	0	?	?	?	?	?	?	0	1	?	?
1276	?	?	?	?	1	?	0	?	?	?	?	?
1277	?	0	0	0	0	?	?	?	?	0	?	0
1278	?	?	0	?	?	?	?	?	1	1	?	?
1279	?	3	0	0	?	?	0	?	?	?	?	?
1280	?	0	0	1	0	?	1	1	?	?	?	1
1281	0	0	?	?	?	0	0	0	0	?	1	1
1282	?	0	0	?	0	?	?	?	?	?	?	?
1283	?	?	?	?	?	?	?	?	?	?	?	?
1284	?	?	?	?	?	?	?	?	?	?	?	?
1285	?	?	?	?	?	?	?	?	?	?	?	?
1286	?	?	?	?	?	?	?	?	?	?	?	?
1287	?	?	?	?	?	?	?	?	?	?	?	?
1288	?	?	?	?	?	?	?	?	?	?	?	?
1289	?											

Cerrejinosuchus_improcerus			?	0	0	0	1	?	?	1	0
1	0	0	0	1	?	0	0	1	0	?	0
0	?	?	?	0	0	?	0	?	0	?	0
0	2	?	?	?	?	?	0	?	0	1	1
?	0	0	0	0	0	0	0	0	0	?	0
0	0	?	0	0	0	0	0	0	0	1	0
1	2	0	0	0	2	1	0	0	1	?	?
1	1	0	1	1	?	0	0	?	?	?	?
?	?	0	?	0	?	1	?	?	?	?	?
?	?	?	?	1	?	0	0	0	?	1	?
?	?	?	?	?	?	?	3	?	?	?	?
0	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	0	0	1	0	?	?	?	?	0	?	0
?	?	?	1	?	?	?	?	?	?	?	?
?	?	?	?	0	0	0	3	?	?	?	?
?	0	1	1	1	?	1	1	?	?	?	1
0	?	?	?	?	?	?	?	?	?	?	1
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?											
Chenanisuchus_lateroculi			?	0	0	0	1	0	?	1	0
1	0	?	?	1	?	0	0	1	0	?	?
0	1	?	0	0	0	?	?	?	0	1	0
0	2	?	?	?	?	?	0	?	0	1	1
1	0	0	0	0	0	0	0	0	0	0	0
?	0	?	0	0	0	0	0	0	1	0	?
0	0	0	0	0	2	0	0	0	1	1	1
1	1	0	?	1	0	0	0	0	0	0	?
?	?	0	?	0	?	?	0	?	?	?	?
0	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	3	1	0	1	?
?	0	?	?	?	?	?	?	0	1	?	?
?	1	?	?	1	0	?	?	2	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	0	?	?	?	?	?	?	?	?	?
?	?	?	?	?	1	0	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	0	1

1333	0	?	?	?	?	?	0	0	0	?	?	?
1334	?	?	?	?	?	?	?	?	?	?	?	?
1335	?	?	?	?	?	?	?	?	?	?	?	?
1336	?	?	?	?	?	?	?	?	?	?	?	?
1337	?	?	?	?	?	?	?	?	?	?	?	?
1338	?	?	?	?	?	?	?	?	?	?	?	?
1339	?	?	?	?	?	?	?	?	?	?	?	?
1340	?	?	?	?	?	?	?	?	?	?	?	?
1341	?											
1342	Guarinisuchus_munizi			?	0	0	0	1	0	?	1	0
1343	1	0	0	0	?	?	0	0	1	0	?	0
1344	0	1	?	0	0	0	?	?	?	0	1	0
1345	0	2	?	?	?	?	?	0	?	0	1	1
1346	?	0	0	1	0	0	0	0	0	0	0	0
1347	0	0	?	0	0	0	0	0	0	0	0	?
1348	0	1	0	0	0	2	1	0	0	1	?	?
1349	1	2	0	?	1	0	0	0	0	0	0	?
1350	?	?	0	?	0	1	1	0	?	?	?	?
1351	0	?	?	?	1	?	0	0	0	1	1	0
1352	?	?	1	?	2	?	?	3	1	0	1	?
1353	?	0	?	?	0	0	1	0	0	1	?	?
1354	?	1	?	?	1	0	0	?	?	?	?	?
1355	?	0	0	0	0	?	?	?	?	0	?	0
1356	?	?	0	?	?	?	?	?	?	?	?	?
1357	?	?	?	?	1	1	0	2	?	?	?	?
1358	?	?	?	?	?	?	?	?	?	?	?	1
1359	0	0	?	?	?	?	0	0	0	?	1	1
1360	?	0	0	?	0	?	?	?	?	?	?	?
1361	?	?	?	?	?	?	?	?	?	?	?	?
1362	?	?	?	?	?	?	?	?	?	?	?	?
1363	?	?	?	?	?	?	?	?	?	?	?	?
1364	?	?	?	?	?	?	?	?	?	?	?	?
1365	?	?	?	?	?	?	?	?	?	?	?	?
1366	0	?	?	?	?	?	?	?	?	?	?	?
1367	?											
1368	Dyrosaurus_maghribensis			?	0	0	0	1	0	?	1	0
1369	1	0	0	0	0	?	0	0	1	0	?	0
1370	0	1	?	0	0	0	?	?	?	0	1	0
1371	0	2	?	?	?	?	?	0	?	0	1	1
1372	1	0	0	0	0	0	0	0	0	0	0	0
1373	?	0	?	0	0	0	0	0	0	0	0	?
1374	1	2	0	0	0	2	1	0	0	1	1	1

1375	1	2	0	?	1	0	0	0	0	0	0	?
1376	?	?	0	1	0	1	1	0	?	?	0	1
1377	0	?	?	?	1	?	0	0	0	1	1	0
1378	0	?	1	?	?	?	?	3	1	0	1	?
1379	?	0	?	?	0	0	1	0	0	1	?	?
1380	?	?	?	?	1	?	0	?	2	?	?	?
1381	?	0	0	0	0	?	?	0	?	0	?	0
1382	?	?	0	1	0	0	?	?	1	1	?	?
1383	?	3	?	?	1	3	0	?	?	?	?	?
1384	?	0	1	1	?	?	1	1	?	?	0	1
1385	0	?	?	?	?	0	0	0	0	?	?	1
1386	?	0	0	?	0	?	?	?	0	1	?	0
1387	0	0	?	?	?	?	0	0	?	?	?	?
1388	0	0	0	?	?	?	?	?	0	?	?	?
1389	1	0	0	?	?	0	0	0	?	0	?	?
1390	?	0	?	?	0	0	0	?	?	0	?	?
1391	1	?	?	?	?	?	0	0	?	0	?	1
1392	0	?	?	0	0	1	?	?	?	?	?	?
1393	?											
1394	Dyrosaurus_phosphaticus			?	0	0	0	1	0	?	1	0
1395	1	0	0	0	1	?	0	0	1	0	?	0
1396	0	1	?	0	0	0	1	?	?	0	1	0
1397	?	2	?	?	?	?	?	0	?	0	1	1
1398	1	0	0	0	0	0	0	0	0	0	0	0
1399	?	0	?	0	0	0	0	0	0	0	0	?
1400	1	2	0	0	0	2	1	0	0	1	1	1
1401	1	2	0	1	1	0	0	0	0	0	0	?
1402	?	?	?	1	0	1	1	0	?	?	0	1
1403	0	?	?	?	1	?	0	0	0	1	1	0
1404	0	?	1	?	2	?	?	3	1	0	1	?
1405	0	0	?	1	0	0	1	0	0	1	?	1
1406	1	1	?	?	1	?	0	?	2	?	?	?
1407	?	0	0	0	0	?	?	0	?	0	?	0
1408	?	?	0	1	?	?	?	?	?	?	?	?
1409	?	?	?	?	1	2	0	?	?	?	?	?
1410	?	0	1	1	1	?	1	1	?	?	0	1
1411	0	0	0	?	?	0	0	0	0	?	1	1
1412	?	0	0	?	0	?	?	?	?	?	?	?
1413	0	?	?	?	?	?	?	?	?	?	?	?
1414	?	?	?	?	?	?	?	?	?	?	?	?
1415	?	?	?	0	?	?	?	?	?	?	?	?
1416	?	?	?	?	?	?	?	?	?	?	?	?
1417	?	?	?	?	?	?	?	?	?	?	?	1

1418	0	?	?	0	0	1	?	?	?	?	?	?
1419	?											
1420	Rhabdognathus_sp.		?	0	0	0	0	0	?	1	0	1
1421	?	?	?	?	?	0	?	?	0	?	?	0
1422	1	0	0	?	0	?	?	?	0	?	0	0
1423	2	?	?	?	?	?	0	?	0	1	1	1
1424	0	0	1	0	0	0	0	0	0	0	0	?
1425	0	?	0	0	0	0	0	0	?	?	?	0
1426	1	0	0	0	2	1	0	0	1	1	1	1
1427	1	?	?	1	0	0	0	0	0	0	?	?
1428	?	0	1	0	?	1	0	1	?	0	?	0
1429	?	?	?	?	?	?	?	?	1	?	?	?
1430	?	?	?	?	?	?	3	1	0	?	0	0
1431	0	?	?	?	?	?	?	0	1	?	?	?
1432	?	1	?	1	0	?	?	2	?	?	0	0
1433	0	0	0	0	?	?	?	?	0	?	0	?
1434	?	0	?	?	?	?	?	?	?	?	?	?
1435	?	?	?	1	?	0	?	?	?	?	?	?
1436	?	?	?	?	?	?	?	?	?	?	?	?
1437	?	?	?	?	?	?	0	0	?	?	?	?
1438	?	?	?	?	?	?	?	?	?	?	?	?
1439	?	?	?	?	?	?	?	?	?	?	?	?
1440	?	?	?	?	?	?	?	?	?	?	?	?
1441	?	?	?	?	?	?	?	?	?	?	?	?
1442	?	?	?	?	?	?	?	?	?	?	?	?
1443	?	?	?	?	?	?	?	?	?	?	?	?
1444	?	?	?	?	?	?	?	?	?	?	?	?
1445	Machimosaurus_mosae			2	1	0	0	?	0	0	1	1
1446	1	0	0	0	?	0	?	2	1	1	0	?
1447	?	1	0	?	0	0	0	0	?	?	?	0
1448	?	2	?	?	?	?	?	0	?	0	0	0
1449	0	?	1	0	0	0	1	0	0	0	0	0
1450	0	0	?	?	?	?	?	0	0	0	0	0
1451	1	0	0	0	?	0	0	?	1	?	?	?
1452	1	2	0	?	1	0	0	0	1	0	0	?
1453	?	2	0	?	?	?	1	0	?	?	?	?
1454	0	?	?	?	1	2	?	?	?	?	?	?
1455	?	0	?	?	?	?	?	?	?	0	0	?
1456	?	?	?	?	?	?	?	?	?	1	?	?
1457	?	0	?	?	?	0	0	?	?	?	?	0
1458	0	0	1	0	0	1	?	0	?	0	?	0
1459	?	?	?	1	?	?	?	1	?	?	?	?

1460	0	1	0	0	2	2	0	2	0	0	?	0
1461	0	0	0	0	0	1	0	0	0	1	0	0
1462	0	0	?	?	1	?	0	0	0	0	0	1
1463	?	?	?	?	?	0	3	1	?	?	?	?
1464	?	?	?	?	?	?	?	?	?	0	1	0
1465	0	?	?	?	?	1	0	?	?	?	?	?
1466	1	?	?	?	?	?	?	?	?	?	?	?
1467	?	?	?	?	1	1	?	?	?	?	?	?
1468	?	?	?	?	1	?	?	?	?	?	?	1
1469	1	0	?	0	0	0	2	?	?	?	?	2
1470	0											
1471	Machimosaurus_buffetauti			{1,2}	1	0	0	?	0	0	1	1
1472	1	0	0	0	?	0	?	2	1	1	0	1
1473	?	1	0	0	0	0	0	0	?	?	?	0
1474	?	2	?	?	?	?	?	0	?	0	0	0
1475	0	?	1	0	0	0	1	0	0	0	0	0
1476	0	0	?	0	0	0	?	?	0	0	0	0
1477	1	0	0	0	?	0	0	?	?	?	1	?
1478	1	2	0	?	1	0	0	0	1	?	?	?
1479	?	2	0	?	?	1	1	0	?	?	?	0
1480	0	?	?	?	1	1	?	?	0	?	1	?
1481	?	?	?	?	?	0	?	?	?	0	0	?
1482	?	?	?	?	?	?	?	?	?	1	?	?
1483	?	0	?	?	?	0	0	?	?	?	?	0
1484	0	0	1	0	0	1	?	0	?	0	?	0
1485	?	?	?	?	?	?	?	1	?	0	?	?
1486	?	?	?	?	2	3	0	1	0	0	?	0
1487	0	0	0	0	0	1	0	0	0	1	0	0
1488	0	0	0	?	1	0	0	0	0	0	0	{0,1}
1489	1	?	?	?	?	0	3	1	?	?	?	?
1490	?	?	?	?	?	?	?	?	?	?	?	?
1491	?	?	?	?	?	?	?	?	?	?	?	?
1492	?	?	?	?	?	?	?	?	?	?	?	?
1493	?	?	?	?	?	?	?	?	?	?	?	?
1494	?	?	?	?	?	?	?	?	?	?	?	1
1495	1	?	?	0	0	0	?	?	?	?	?	?
1496	?											
1497	Steneosaurus_obtusidens			1	0	0	0	?	?	?	1	1
1498	?	0	0	0	?	0	?	?	1	?	0	?
1499	?	1	?	?	0	0	0	0	?	?	?	?
1500	?	2	?	?	?	?	?	0	?	?	?	?
1501	?	?	?	?	0	0	1	?	?	?	?	?

1502	?	?	?	?	?	?	?	0	0	0	0	?
1503	1	?	?	0	?	?	?	?	1	?	?	?
1504	1	2	?	?	1	0	?	?	?	?	?	?
1505	?	?	?	?	?	?	1	?	?	?	?	?
1506	?	?	?	?	1	?	?	?	?	?	?	?
1507	?	0	?	?	?	0	?	?	?	?	0	?
1508	?	?	?	?	?	?	?	?	?	?	?	?
1509	?	0	?	?	?	0	0	?	?	?	?	?
1510	?	0	1	0	0	1	?	?	?	0	?	0
1511	?	?	?	?	?	?	?	?	?	?	?	?
1512	?	?	?	?	1	4	?	1	?	0	?	0
1513	?	0	?	?	?	1	?	?	?	1	?	0
1514	0	?	?	?	1	?	0	0	0	0	?	1
1515	1	1	1	1	1	0	3	1	?	?	?	?
1516	?	?	?	?	?	?	?	?	?	?	1	?
1517	0	?	?	?	?	?	?	?	?	?	?	1
1518	?	?	?	?	?	?	?	?	?	?	?	?
1519	?	?	?	0	1	1	?	?	?	?	1	?
1520	?	?	?	?	1	?	?	?	?	?	?	1
1521	1	0	?	0	0	0	2	1	1	?	?	2
1522	0											
1523	Steneosaurus_edwardsi			1	0	0	0	?	0	?	1	1
1524	1	0	0	0	1	0	0	2	1	1	0	1
1525	0	1	0	0	0	0	0	0	?	0	1	0
1526	0	2	?	?	?	?	?	0	?	0	0	0
1527	0	?	1	0	0	0	0	0	0	0	?	0
1528	0	0	?	0	0	0	0	0	0	0	0	0
1529	1	0	0	0	0	0	0	1	1	?	?	?
1530	1	2	0	?	1	1	0	0	?	0	0	?
1531	?	2	0	?	0	?	1	0	0	0	?	?
1532	?	?	0	0	?	{1,2}	?	?	?	?	1	?
1533	?	0	?	?	?	0	?	0	0	0	?	0
1534	0	0	?	?	0	?	0	1	0	1	?	?
1535	?	0	?	?	?	0	0	?	?	?	?	0
1536	0	0	1	0	0	1	3	0	?	0	?	0
1537	?	?	?	1	?	?	?	1	0	?	?	0
1538	0	1	0	1	?	3	0	1	0	0	?	0
1539	?	0	0	0	0	1	0	0	0	1	?	1
1540	0	?	0	?	0	?	0	0	0	0	?	?
1541	?	?	?	?	?	0	3	0	0	?	?	?
1542	0	0	0	?	?	0	0	0	0	0	0	0
1543	0	?	?	0	0	1	0	?	?	2	0	1
1544	0	?	?	2	?	?	?	?	?	?	?	?

1545	?	0	?	0	1	1	0	?	?	0	1	?
1546	0	0	?	?	1	?	?	?	?	?	2	1
1547	1	0	?	0	0	0	2	?	?	?	?	1
1548	0											
1549	Steneosaurus_gracilirostris			0	0	0	0	3	?	?	1	1
1550	1	0	0	0	1	0	0	2	1	1	0	1
1551	?	1	?	?	0	0	0	?	?	?	?	0
1552	?	1	?	?	1	0	0	0	0	0	0	0
1553	0	?	?	0	0	0	0	1	0	0	?	0
1554	0	0	?	0	0	0	?	0	0	0	0	0
1555	1	0	0	0	0	0	0	?	1	0	?	?
1556	1	2	0	?	2	1	0	0	1	0	?	?
1557	?	2	0	?	?	?	1	0	0	?	?	?
1558	?	?	?	?	?	?	?	?	?	?	?	?
1559	?	?	?	0	?	0	?	?	?	0	0	?
1560	?	?	?	?	?	?	?	?	?	?	?	?
1561	?	0	?	?	?	0	0	?	?	?	?	?
1562	?	0	1	0	0	?	?	?	0	0	?	0
1563	?	?	?	?	?	?	?	?	?	?	?	?
1564	?	?	?	?	?	4	?	0	0	?	?	?
1565	?	?	?	?	?	?	?	?	?	?	?	?
1566	?	?	?	?	0	?	0	0	0	0	?	?
1567	?	?	?	?	?	0	?	?	?	?	?	?
1568	?	?	?	?	?	?	?	?	?	?	?	?
1569	0	?	?	?	?	?	?	?	?	?	?	?
1570	?	?	?	1	?	?	?	?	?	?	?	?
1571	?	?	?	?	?	0	?	?	?	?	?	?
1572	?	?	?	?	0	?	?	?	?	?	?	1
1573	1	1	?	0	0	0	2	?	?	?	?	1
1574	?											
1575	Steneosaurus_bollensis			{0,1}	0	0	0	3	0	?	1	1
1576	1	0	0	0	1	0	0	2	1	1	0	1
1577	0	1	0	0	0	0	0	0	0	0	0	0
1578	0	1	?	?	?	0	0	0	0	0	0	0
1579	0	?	1	0	0	0	0	0	0	0	0	0
1580	0	0	?	0	0	0	0	0	0	0	0	0
1581	1	0	0	0	0	0	0	1	0	0	1	1
1582	1	2	0	?	1	1	0	0	1	1	0	?
1583	?	2	0	0	0	1	1	0	0	0	0	?
1584	0	0	0	0	?	?	?	?	?	0	1	0
1585	0	1	0	0	?	?	?	0	0	0	?	0
1586	0	0	?	0	0	1	0	1	0	1	0	1

1587	0	0	?	0	1	0	0	0	1	0	?	0
1588	0	0	1	0	0	3	3	0	0	0	0	0
1589	1	1	0	1	1	1	1	1	0	?	1	0
1590	0	1	0	0	1	4	0	1	0	0	?	0
1591	0	0	0	0	0	1	0	0	?	0	0	1
1592	0	0	1	?	0	0	0	0	0	0	1	1
1593	?	?	?	?	?	0	3	0	0	?	0	0
1594	0	0	?	1	0	0	0	0	?	?	0	?
1595	0	?	0	0	0	1	0	0	1	2	?	1
1596	0	0	0	2	0	0	0	0	0	0	0	0
1597	0	0	1	0	0	0	0	?	?	0	1	?
1598	0	0	?	1	0	0	0	0	2	0	0	1
1599	1	0	0	0	0	0	2	1	1	0	0	1
1600	0											
1601	Steneosaurus_leedsi		0	0	0	0	3	0	?	1	1	1
1602	0	0	0	1	0	0	2	1	1	0	?	0
1603	1	0	0	0	0	0	0	0	0	0	0	0
1604	1	?	?	?	0	0	0	0	0	0	0	0
1605	?	?	0	0	0	0	0	0	0	?	0	0
1606	0	?	0	0	0	0	0	0	0	0	0	1
1607	0	0	0	0	0	0	1	0	0	?	?	1
1608	2	0	?	1	1	0	0	?	0	0	?	?
1609	2	0	0	0	1	1	0	0	0	0	?	0
1610	0	0	0	1	1	0	0	0	0	1	0	0
1611	1	0	0	1	0	?	0	0	0	?	0	0
1612	0	?	?	0	1	0	1	0	1	0	1	0
1613	0	?	0	1	0	0	0	1	?	?	0	0
1614	0	1	0	0	3	{2,3}	0	0	0	?	0	1
1615	1	0	1	1	1	1	?	0	?	1	0	0
1616	1	0	0	1	4	0	0	0	0	?	0	?
1617	0	0	0	0	1	0	0	0	0	0	1	0
1618	0	1	?	0	0	0	0	0	0	1	?	?
1619	?	?	?	?	0	3	0	0	1	0	0	0
1620	0	1	1	0	0	0	0	0	1	0	0	0
1621	0	0	0	0	1	0	0	1	2	0	1	0
1622	0	0	2	0	0	0	0	0	0	0	0	0
1623	0	1	0	1	1	0	0	0	0	1	1	0
1624	0	0	1	1	0	?	0	?	0	2	1	1
1625	0	?	0	0	0	2	1	1	0	?	1	0
1626	Steneosaurus_heberti		1	?	?	0	?	?	?	1	1	?
1627	0	0	0	?	?	?	?	1	?	0	0	?
1628	1	?	?	0	?	0	0	?	?	?	?	?

1629	2	?	?	?	?	?	0	?	?	?	?	?
1630	?	?	?	?	?	?	0	?	?	?	?	?
1631	?	?	?	?	?	?	0	0	0	0	?	1
1632	?	?	0	?	?	?	?	0	?	1	1	1
1633	2	0	0	1	1	?	?	1	0	0	?	?
1634	?	?	?	?	?	1	?	?	?	?	?	?
1635	?	?	?	?	?	?	?	?	?	?	?	?
1636	1	?	?	?	0	?	?	?	?	0	?	?
1637	?	?	?	?	?	?	1	?	?	?	?	?
1638	0	?	?	?	0	0	?	?	?	?	?	?
1639	?	?	?	?	2	?	?	0	0	0	0	?
1640	?	?	?	?	?	?	?	?	?	?	?	?
1641	?	?	?	1	4	?	0	0	?	?	?	0
1642	0	0	0	0	1	0	0	?	1	?	?	?
1643	?	?	?	0	?	?	0	0	0	?	1	?
1644	?	?	?	?	?	3	?	?	?	?	?	?
1645	?	?	?	?	?	?	?	?	?	?	?	?
1646	?	?	?	?	?	?	?	?	?	?	?	?
1647	?	?	?	?	?	?	?	?	?	?	?	?
1648	?	?	?	?	?	?	?	?	?	?	?	?
1649	?	?	?	?	?	?	?	?	?	?	?	?
1650	?	?	?	?	?	?	?	?	?	?	?	?
1651	Teleosaurus_cadomensis			?	0	0	1	3	0	?	1	1
1652	1	?	?	?	1	?	0	2	1	1	0	?
1653	0	1	0	0	0	0	0	0	0	0	?	0
1654	0	1	?	?	1	0	0	0	0	0	0	0
1655	0	?	1	0	1	0	0	0	0	0	0	0
1656	0	0	?	0	0	0	0	0	0	0	0	0
1657	1	0	0	1	0	0	0	1	0	0	1	1
1658	1	2	0	?	1	0	0	0	1	1	0	?
1659	?	2	0	?	0	1	1	0	0	0	0	0
1660	0	0	0	0	1	?	0	0	0	0	1	0
1661	0	0	0	0	1	1	?	0	0	0	0	0
1662	0	0	?	0	0	1	0	0	0	1	?	1
1663	0	0	0	0	1	0	0	?	1	0	?	0
1664	0	0	1	0	0	?	3	0	?	0	?	?
1665	?	?	?	1	?	?	?	?	0	?	1	0
1666	0	1	0	0	0	4	0	0	?	?	?	?
1667	?	?	?	?	?	?	?	?	?	?	0	?
1668	?	0	1	?	0	0	0	0	0	0	1	?
1669	?	?	?	?	?	0	?	?	?	?	0	?
1670	0	?	?	?	?	0	?	?	?	?	0	?
1671	?	?	?	?	0	?	?	0	?	?	?	1

1672	?	?	?	1	?	?	?	?	0	?	0	0
1673	0	?	?	?	0	0	?	?	?	?	1	?
1674	?	?	?	?	?	?	?	?	?	?	?	1
1675	1	1	?	0	0	0	2	1	1	0	0	0
1676	0											
1677	Platysuchus_multiscrobiculatus				1	0	0	0	3	0	?	1
1678	1	1	0	?	?	1	?	0	2	1	1	0
1679	1	0	1	0	0	0	0	0	?	0	0	0
1680	0	0	1	?	?	?	0	0	0	0	0	0
1681	0	?	?	1	0	0	0	0	0	0	0	0
1682	0	0	0	?	0	0	0	0	0	0	0	0
1683	0	1	0	1	1	0	0	0	1	?	0	1
1684	1	1	2	0	?	1	1	0	0	1	1	1
1685	?	?	2	0	?	?	?	1	0	?	0	?
1686	?	0	?	?	?	?	?	?	?	?	0	?
1687	?	?	0	?	?	?	0	?	?	?	0	?
1688	?	?	?	?	?	?	?	?	?	?	1	?
1689	?	?	?	?	0	1	0	0	?	?	?	?
1690	0	0	0	1	0	0	?	3	0	0	0	0
1691	0	1	1	0	?	?	?	?	?	?	?	?
1692	0	0	1	0	0	0	4	0	0	?	?	?
1693	?	?	0	0	0	0	?	?	?	?	?	0
1694	?	?	0	1	?	0	0	0	0	0	0	1
1695	1	?	?	?	?	?	0	3	?	?	?	0
1696	0	0	0	?	?	?	0	?	?	?	?	0
1697	?	0	?	0	?	?	?	?	0	1	2	?
1698	1	?	?	0	1	0	0	0	0	0	0	0
1699	0	0	0	?	0	0	0	0	?	?	?	1
1700	?	0	?	?	1	0	0	0	0	2	?	0
1701	1	1	1	?	0	0	0	2	1	1	0	0
1702	0	0										
1703	Steneosaurus_brevior		1	0	0	0	3	0	?	0	1	1
1704	0	0	0	1	?	0	2	1	1	0	1	?
1705	1	0	0	0	0	0	0	?	?	?	0	?
1706	1	?	?	1	0	0	0	0	0	0	0	0
1707	?	1	0	0	0	0	0	0	?	?	0	0
1708	0	?	0	0	?	?	0	0	0	0	0	1
1709	0	0	0	0	0	0	?	1	?	?	?	?
1710	?	?	?	1	0	0	0	1	1	0	?	?
1711	2	0	?	0	1	1	0	0	0	?	?	?
1712	?	0	0	1	?	0	0	0	?	1	0	0
1713	0	0	0	1	0	?	0	0	0	?	0	?

1714	0	?	?	?	?	0	0	0	1	?	?	?
1715	?	?	?	?	?	0	?	?	?	?	0	0
1716	0	1	0	0	2	?	?	0	0	0	0	?
1717	?	?	?	?	?	?	?	?	?	?	?	?
1718	?	?	?	2	3	0	1	?	?	?	?	?
1719	0	0	0	0	?	?	?	?	?	?	?	?
1720	?	?	?	0	?	?	0	0	0	?	?	?
1721	?	?	?	?	0	?	?	?	?	?	?	?
1722	?	?	?	?	?	?	?	?	?	?	?	?
1723	?	?	?	?	?	?	?	?	?	?	?	?
1724	?	?	?	?	?	?	?	?	?	?	?	?
1725	?	?	?	?	?	?	?	?	?	?	?	?
1726	?	?	?	?	?	?	?	?	?	?	?	?
1727	?	?	?	?	?	?	?	?	?	?	?	?
1728	Peipehsuchus_teleorhinus			?	0	0	0	?	0	?	1	1
1729	1	?	?	?	0	?	0	2	1	1	?	1
1730	0	1	0	0	0	0	0	?	0	0	0	0
1731	?	1	?	?	?	0	0	0	?	0	0	0
1732	0	0	1	0	0	0	0	0	0	0	0	0
1733	0	0	?	0	0	?	0	0	0	?	0	0
1734	1	0	0	0	0	0	0	1	1	?	?	?
1735	1	2	0	?	1	1	0	0	?	1	?	?
1736	?	2	0	?	?	?	1	?	?	?	?	?
1737	0	?	0	0	1	?	0	0	0	0	1	0
1738	0	0	0	?	1	?	?	0	0	0	?	0
1739	0	0	?	?	0	?	0	0	0	1	?	?
1740	?	?	?	?	?	?	?	?	1	?	?	?
1741	?	?	?	?	?	?	?	?	?	?	?	?
1742	?	?	?	?	?	?	?	?	?	?	?	?
1743	?	?	?	?	2	3	0	?	?	?	?	?
1744	?	?	?	?	?	?	?	?	?	?	0	?
1745	?	?	?	?	?	?	?	?	?	?	?	?
1746	?	?	?	?	?	?	3	?	?	?	?	?
1747	?	?	?	?	?	?	?	?	?	?	?	?
1748	?	?	?	?	?	?	?	?	?	?	?	?
1749	?	?	?	?	?	?	?	?	?	?	?	?
1750	?	?	?	?	?	?	?	?	?	?	?	?
1751	?	?	?	?	?	?	?	?	?	?	?	?
1752	?	?	?	?	?	?	?	?	?	?	?	?
1753	?											
1754	Pelagosaurus_typus		0	0	0	0	3	0	0	1	0	1
1755	?	0	0	0	?	0	2	1	1	0	1	0

1756	1	0	0	0	0	0	0	0	0	0	0	0
1757	1	?	?	1	0	0	0	0	0	0	0	0
1758	?	1	{0,1}	0	0	0	0	0	0	0	0	0
1759	0	?	0	0	0	0	0	0	0	0	0	0
1760	0	0	0	0	0	0	1	1	0	1	1	1
1761	2	0	0	2	0	0	0	1	0	0	?	?
1762	2	1	0	0	0	1	0	0	0	0	0	0
1763	0	0	0	1	?	0	0	0	0	1	0	0
1764	0	0	0	1	0	0	0	0	0	0	0	1
1765	0	0	0	0	0	0	0	0	1	0	1	0
1766	0	0	0	1	0	0	?	1	0	2	0	0
1767	0	0	0	0	3	3	0	0	0	0	0	1
1768	1	0	1	1	1	1	1	0	0	?	0	0
1769	1	0	0	1	3	0	0	0	0	?	0	0
1770	0	0	0	0	1	0	0	0	0	0	1	0
1771	0	1	?	0	0	0	0	0	0	1	0	0
1772	0	0	?	0	0	0	0	0	1	0	0	0
1773	0	?	1	0	0	0	0	?	?	0	0	0
1774	0	0	1	0	1	0	0	1	2	?	1	0
1775	0	0	1	0	0	0	0	0	0	0	0	0
1776	0	?	0	1	0	0	?	?	0	1	?	0
1777	0	?	1	0	0	?	0	?	0	0	1	0
1778	0	0	0	0	0	2	1	1	1	1	0	1
1779	Teleidosaurus_calvadosii			?	0	0	0	3	0	0	1	2
1780	1	0	0	0	1	0	0	2	1	1	0	1
1781	0	1	0	0	0	0	0	0	0	0	1	0
1782	0	2	?	?	?	?	?	0	?	0	0	0
1783	0	?	?	0	0	0	0	0	0	0	0	0
1784	0	0	?	0	1	0	0	0	0	0	0	0
1785	0	0	0	0	0	0	0	1	1	0	?	?
1786	1	2	0	?	2	0	1	1	0	0	0	?
1787	?	2	?	?	1	0	1	1	0	1	0	?
1788	0	0	0	0	1	2	0	0	0	0	1	0
1789	0	?	0	?	?	0	?	0	0	0	0	0
1790	1	0	?	?	?	0	0	?	0	1	?	1
1791	0	0	?	0	1	0	0	0	?	1	?	0
1792	0	0	0	0	0	2	2	0	0	0	0	0
1793	1	1	0	1	1	1	1	?	0	0	?	0
1794	0	1	0	0	2	2	0	2	0	0	0	0
1795	0	0	0	0	0	1	0	0	0	?	0	?
1796	?	?	?	?	0	?	0	0	0	0	1	1
1797	?	?	?	?	?	?	?	?	?	?	?	?
1798	?	?	?	?	?	?	?	?	?	?	?	?

1799	?	?	?	?	?	?	?	?	?	?	?	?
1800	?	?	?	?	?	?	?	?	?	?	?	?
1801	?	?	?	?	?	?	?	?	?	?	?	?
1802	?	?	?	?	?	?	?	?	?	?	?	?
1803	?	?	?	?	?	?	?	?	?	?	?	?
1804	?											
1805	Eoneustes_bathonicus		?	0	0	0	3	0	?	?	?	?
1806	?	?	?	?	?	?	2	?	1	0	1	0
1807	1	?	?	0	0	?	?	0	1	1	0	0
1808	2	?	?	?	?	?	1	?	0	0	?	?
1809	?	1	0	?	?	?	0	0	0	0	1	0
1810	1	0	0	1	1	0	0	0	0	0	0	0
1811	0	0	0	0	0	0	1	?	?	?	?	?
1812	?	?	?	2	1	0	1	0	0	0	?	?
1813	2	?	?	1	?	?	1	0	?	?	?	?
1814	0	0	0	?	?	?	?	?	?	1	?	?
1815	?	?	?	?	?	?	?	?	?	?	?	?
1816	?	?	?	?	?	?	?	?	?	?	?	?
1817	?	?	?	?	?	?	?	?	?	?	?	?
1818	?	?	?	?	?	?	?	?	?	?	?	?
1819	?	?	?	?	?	?	?	?	?	?	?	?
1820	?	?	?	?	?	0	?	?	?	?	?	?
1821	?	?	?	?	?	?	?	?	?	?	?	?
1822	?	0	?	?	?	?	?	?	?	?	?	?
1823	?	?	?	?	?	?	?	?	?	?	?	?
1824	?	?	?	?	?	?	?	?	?	?	?	?
1825	?	?	?	?	?	?	?	?	?	?	?	?
1826	?	?	?	?	?	?	?	?	?	?	?	?
1827	?	?	?	?	?	?	?	?	?	?	?	?
1828	?	?	?	?	?	?	?	?	?	?	?	?
1829	?	?	?	?	?	?	?	?	?	?	?	?
1830	Eoneustes_gaudryi		?	0	0	0	3	0	?	?	?	?
1831	?	?	?	?	?	?	?	?	1	0	1	0
1832	1	?	?	0	0	0	0	0	1	1	0	0
1833	2	?	?	?	?	?	1	?	0	0	0	?
1834	?	1	0	?	?	?	?	?	0	0	1	0
1835	1	0	0	1	1	0	0	0	0	0	0	0
1836	0	0	0	0	0	0	?	?	?	?	?	?
1837	?	?	?	2	1	0	1	0	0	0	?	?
1838	2	?	?	1	0	1	1	0	?	0	?	?
1839	0	0	0	?	?	?	?	?	?	1	?	?
1840	?	?	?	?	?	?	?	?	?	?	?	?

1841	?	?	?	?	?	?	?	?	?	?	1	0
1842	?	?	?	?	?	?	?	?	?	?	?	?
1843	?	?	?	?	?	?	?	?	?	?	?	?
1844	?	?	?	?	?	?	?	?	?	?	?	?
1845	?	?	?	?	?	0	?	?	?	?	?	?
1846	?	?	?	?	?	?	?	?	?	0	?	?
1847	?	?	?	?	?	?	?	?	?	1	1	?
1848	?	?	?	?	?	?	?	?	?	?	?	?
1849	?	?	?	?	?	?	?	?	?	?	?	?
1850	?	?	?	?	?	?	?	?	?	?	?	?
1851	?	?	?	?	?	?	?	?	?	?	?	?
1852	?	?	?	?	?	?	?	?	?	?	?	?
1853	?	?	?	?	?	?	?	?	?	?	?	?
1854	?	?	?	?	?	?	?	?	?	?	?	?
1855	Chile_metriorhynchoid			?	?	?	?	?	?	?	?	?
1856	?	?	?	?	?	?	?	?	?	?	?	?
1857	?	?	?	?	?	0	?	?	?	?	?	?
1858	?	?	?	?	?	?	?	?	?	?	0	0
1859	?	?	1	?	0	0	0	0	1	0	0	2
1860	0	1	?	0	1	?	?	0	?	?	?	0
1861	0	?	0	0	?	0	0	?	0	?	?	?
1862	?	?	?	?	2	1	?	?	0	0	0	?
1863	?	2	?	?	?	?	?	?	?	?	?	?
1864	?	?	?	?	?	?	?	?	?	?	?	?
1865	?	?	?	?	?	?	?	?	?	?	?	?
1866	?	?	?	?	?	?	?	?	?	?	?	?
1867	?	?	?	?	?	?	?	?	?	?	?	?
1868	?	?	?	?	?	?	?	?	?	?	?	?
1869	?	?	?	?	?	?	?	?	?	?	?	?
1870	?	?	?	?	?	?	0	?	?	?	?	?
1871	?	?	?	?	?	?	?	?	?	?	?	?
1872	?	?	?	?	0	?	?	?	?	?	?	?
1873	?	?	?	?	?	?	?	?	?	?	?	?
1874	?	?	?	?	?	?	?	?	?	?	?	?
1875	?	?	?	?	?	?	?	?	?	?	?	?
1876	?	?	?	?	?	?	?	?	?	?	?	?
1877	?	?	?	?	?	?	?	?	?	?	?	?
1878	?	?	?	?	?	?	?	?	?	?	?	?
1879	?	?	?	?	?	?	?	?	?	?	?	?
1880	?											
1881	Zoneait_Nargorum		?	0	0	?	?	?	?	?	?	?
1882	?	?	?	?	?	?	?	?	?	?	?	?

1883	?	?	?	0	0	?	?	?	?	?	1	?
1884	?	?	?	?	?	?	?	?	?	0	0	0
1885	?	1	1	0	0	0	0	1	0	?	2	?
1886	?	?	?	?	?	?	0	?	?	?	0	0
1887	?	0	0	1	0	0	?	0	?	?	?	?
1888	?	?	?	?	?	?	?	0	0	0	?	?
1889	2	?	?	?	?	?	?	?	?	?	?	?
1890	?	?	?	?	?	?	?	?	?	?	0	?
1891	?	0	?	?	?	?	?	?	?	?	?	?
1892	?	?	?	?	?	0	0	?	?	?	?	?
1893	?	?	?	?	?	?	?	?	?	?	?	?
1894	?	?	?	?	?	?	?	?	?	?	?	?
1895	?	?	?	?	?	?	?	?	?	?	?	?
1896	?	?	?	?	?	?	?	?	?	?	?	?
1897	?	?	?	?	?	?	?	?	?	?	?	?
1898	?	?	?	?	?	?	?	0	?	?	?	?
1899	?	?	?	?	?	?	?	?	?	?	?	?
1900	?	?	?	?	?	?	?	?	?	?	?	?
1901	?	?	?	?	?	?	?	?	?	?	?	?
1902	?	?	?	?	?	?	?	0	?	?	?	?
1903	?	?	?	?	?	?	?	?	?	?	?	?
1904	?	?	?	?	?	?	?	?	?	?	?	?
1905	?	?	?	?	?	?	?	?	?	?	?	?
1906	Cricosaurus_elegans		?	0	0	0	2	1	?	1	3	3
1907	?	?	?	3	0	1	2	1	1	1	1	0
1908	1	0	0	0	0	0	0	1	1	1	1	1
1909	?	?	?	?	?	?	1	?	1	0	0	0
1910	?	1	2	0	0	0	1	1	1	0	2	0
1911	1	0	0	1	0	0	1	0	0	0	2	0
1912	0	1	1	1	?	0	1	0	0	?	?	?
1913	?	1	?	3	1	0	1	0	0	0	1	0
1914	2	1	0	1	0	1	1	0	1	0	?	2
1915	0	0	0	?	?	?	?	?	0	?	?	?
1916	?	?	?	?	?	?	1	?	0	?	?	?
1917	?	?	?	?	?	?	?	?	1	0	1	0
1918	?	?	?	?	?	?	0	?	?	?	1	0
1919	0	0	0	0	1	3	1	0	0	0	0	1
1920	1	0	1	1	1	1	?	0	?	1	1	?
1921	1	1	1	2	3	0	1	?	?	?	?	?
1922	?	?	?	?	?	?	?	?	?	0	0	0
1923	0	1	?	0	0	0	?	0	0	1	0	0
1924	0	0	?	0	0	0	0	?	?	?	?	?
1925	?	?	?	?	?	?	?	?	?	?	?	?

1926	?	?	?	?	?	?	?	?	?	?	?	?
1927	?	?	?	?	?	?	?	?	?	?	?	?
1928	?	?	?	?	?	?	?	?	?	?	?	?
1929	?	?	?	?	?	?	?	?	?	?	?	?
1930	?	?	?	?	?	?	?	?	?	?	?	?
1931	Cricosaurus_suevicus		?	0	0	0	0	1	?	1	3	3
1932	?	?	?	3	0	1	2	1	1	1	1	0
1933	1	0	0	0	0	0	0	1	1	1	1	1
1934	?	?	?	?	?	?	1	?	1	0	0	0
1935	?	1	2	0	0	0	1	1	1	0	2	0
1936	1	0	0	1	0	0	3	0	0	0	2	0
1937	0	1	1	1	?	0	1	0	0	?	?	1
1938	2	1	?	3	1	0	1	0	0	0	1	0
1939	2	1	0	1	0	1	1	0	1	0	?	2
1940	0	0	0	?	?	?	?	?	0	?	?	?
1941	?	?	?	?	?	?	1	?	0	?	?	?
1942	?	?	?	?	?	?	?	?	1	0	1	0
1943	?	?	?	?	?	?	0	?	?	?	1	0
1944	0	0	0	0	1	3	1	0	0	0	0	1
1945	1	0	1	1	1	1	?	0	?	1	1	?
1946	1	1	1	1	3	0	1	?	?	?	?	?
1947	?	?	?	?	1	?	?	?	?	0	0	0
1948	0	1	?	0	0	0	?	0	0	1	0	0
1949	0	0	?	0	0	0	0	1	1	1	2	0
1950	2	?	?	?	0	?	1	?	?	0	?	0
1951	1	1	?	0	1	1	1	2	2	?	?	0
1952	0	2	0	1	1	1	2	1	1	1	1	1
1953	1	?	?	1	0	1	?	?	2	?	?	0
1954	0	?	?	3	1	1	3	?	1	2	0	?
1955	?	0	?	?	?	?	?	?	2	1	?	?
1956	Cricosaurus_schroederi			?	0	0	0	0	1	?	1	?
1957	?	?	?	?	?	?	?	?	?	1	1	1
1958	0	1	?	0	0	0	0	0	0	?	1	1
1959	1	2	?	?	?	?	?	1	?	1	0	0
1960	0	?	1	3	0	?	0	1	1	1	0	2
1961	0	1	0	0	1	0	0	3	0	0	0	2
1962	0	0	1	1	1	0	0	1	0	0	?	?
1963	1	2	1	0	3	1	0	1	0	0	0	1
1964	0	2	1	?	1	0	1	1	0	?	0	?
1965	2	0	?	?	?	?	?	?	?	?	?	?
1966	?	?	?	?	?	?	0	1	0	0	0	?
1967	1	0	?	?	?	?	?	?	0	1	?	?

1968	?	0	?	0	?	0	0	?	?	1	?	?
1969	?	?	?	?	?	?	?	1	?	?	?	?
1970	1	1	0	?	1	1	?	?	?	0	?	?
1971	0	1	1	1	?	?	0	?	?	?	?	?
1972	?	?	?	?	?	?	?	?	?	?	0	0
1973	0	0	1	?	0	?	0	0	0	0	1	0
1974	0	0	0	?	0	0	0	0	1	1	?	?
1975	0	?	?	?	?	?	?	?	?	?	?	?
1976	?	?	?	?	0	?	?	?	?	?	?	?
1977	?	?	?	?	?	?	?	?	?	?	?	?
1978	?	?	?	?	?	?	?	?	?	?	?	?
1979	?	?	?	?	?	?	?	?	?	?	?	?
1980	?	?	?	?	?	?	?	?	?	?	?	?
1981	?											
1982	Cricosaurus_araucanensis			?	0	0	0	0	1	?	1	3
1983	3	?	0	0	3	0	1	2	1	1	1	1
1984	1	1	0	0	0	0	0	0	?	1	1	1
1985	1	2	?	?	?	?	?	1	?	1	0	0
1986	0	?	1	2	0	1	0	1	1	1	0	2
1987	0	1	0	0	1	0	0	3	0	0	0	2
1988	0	0	1	1	1	0	0	1	0	0	?	?
1989	1	2	1	0	3	1	0	1	0	0	0	1
1990	0	2	?	?	?	0	1	1	0	1	0	?
1991	2	0	0	0	1	?	1	?	1	0	1	0
1992	0	?	0	0	2	0	?	1	0	0	0	?
1993	1	0	1	0	1	?	0	0	0	1	?	1
1994	0	?	0	0	?	0	0	?	1	?	?	1
1995	0	0	0	0	0	?	?	?	0	0	0	0
1996	?	?	?	?	1	1	1	1	0	?	1	1
1997	0	1	1	1	2	3	0	1	0	0	0	0
1998	0	0	0	0	0	1	0	0	?	?	0	?
1999	?	?	1	?	0	0	?	0	0	0	?	0
2000	0	0	0	?	0	0	0	?	?	?	?	?
2001	0	?	?	?	?	?	?	?	?	?	?	?
2002	?	?	?	?	0	?	?	?	2	2	?	?
2003	?	?	2	0	1	1	1	2	1	1	1	1
2004	1	1	?	?	?	?	?	?	?	?	?	?
2005	?	?	?	?	?	?	?	?	?	?	?	?
2006	?	?	?	?	?	?	?	?	?	?	?	?
2007	?											
2008	Cricosaurus_vignaudi		?	0	0	0	0	1	?	?	?	3
2009	?	?	?	3	?	?	2	1	1	1	?	0

2010	1	?	0	?	0	0	0	?	?	1	1	?
2011	2	?	?	?	?	?	?	?	?	0	?	0
2012	?	1	2	0	1	0	1	1	1	?	2	0
2013	1	0	0	1	0	0	3	0	0	0	2	0
2014	0	1	1	1	?	0	1	0	0	?	?	?
2015	2	1	?	3	?	0	1	?	?	?	1	0
2016	2	1	?	?	?	?	1	0	1	0	?	?
2017	0	0	0	?	?	?	?	?	?	?	?	?
2018	?	?	?	?	?	?	?	?	0	?	?	?
2019	?	?	?	?	?	?	?	?	?	?	1	0
2020	?	?	?	?	?	?	?	?	?	?	?	?
2021	0	0	0	0	?	3	1	?	0	?	0	?
2022	?	?	1	1	1	?	?	?	?	?	?	?
2023	?	?	?	2	2	0	?	?	0	?	?	?
2024	?	?	?	?	?	?	?	?	?	?	0	0
2025	?	1	?	0	?	?	?	0	0	?	?	?
2026	?	?	?	?	?	?	?	1	?	?	?	0
2027	?	?	?	?	?	?	?	?	?	?	?	?
2028	?	?	?	?	?	?	?	?	?	?	?	?
2029	?	?	?	?	?	?	?	?	?	?	?	?
2030	?	?	?	?	?	?	?	?	?	?	?	?
2031	?	?	?	?	?	?	?	?	?	?	?	?
2032	?	?	?	?	?	?	?	?	?	?	?	?
2033	Dakosaurus_lissocephalus			?	?	?	?	?	?	?	?	?
2034	?	?	?	?	?	?	?	?	?	1	1	1
2035	0	1	?	?	?	?	?	?	?	1	1	?
2036	?	?	?	?	?	?	?	?	?	?	0	?
2037	?	?	1	2	0	0	0	?	1	1	?	2
2038	0	1	?	0	?	0	0	1	0	0	?	1
2039	?	?	1	?	1	0	0	1	0	0	?	?
2040	1	2	1	0	?	?	?	1	?	?	?	1
2041	0	?	?	?	?	?	1	?	?	?	?	?
2042	?	?	?	?	?	?	?	?	?	?	?	?
2043	?	?	?	?	?	?	?	3	0	?	?	0
2044	1	?	?	?	?	?	?	?	?	?	?	?
2045	?	?	?	0	?	0	0	?	?	?	?	?
2046	?	?	?	?	?	?	?	?	?	?	?	?
2047	?	?	?	?	?	?	?	?	?	?	?	?
2048	?	?	?	?	?	?	?	?	?	?	?	?
2049	?	?	?	?	?	?	?	?	?	?	?	?
2050	?	?	?	?	?	?	?	?	?	?	?	?
2051	?	?	?	?	?	?	?	?	?	?	?	?
2052	?	?	?	?	?	?	?	?	?	?	?	?

2053	?	?	?	?	?	?	?	?	?	?	?	?
2054	?	?	?	?	?	?	?	?	?	?	?	?
2055	?	?	?	?	?	?	?	?	?	?	?	?
2056	?	?	?	?	?	?	?	?	?	?	?	?
2057	?	?	?	?	?	?	?	?	?	?	?	?
2058	?											
2059	Cricosaurus_sp_Cuba		?	?	?	?	?	?	?	?	?	?
2060	?	?	?	?	?	?	?	?	1	?	?	?
2061	1	?	?	?	?	?	?	?	?	?	1	?
2062	?	?	?	?	?	?	?	?	?	0	?	0
2063	?	1	2	0	0	0	1	1	0	?	2	0
2064	1	0	0	1	?	?	1	?	0	?	1	0
2065	0	?	?	?	0	0	1	0	?	?	?	?
2066	2	0	?	3	?	0	1	?	?	?	1	0
2067	2	?	?	?	?	?	?	0	?	0	?	?
2068	?	?	?	?	?	?	?	?	?	?	?	?
2069	?	?	?	?	?	?	?	?	0	?	?	?
2070	0	?	?	?	?	?	?	0	1	?	1	0
2071	?	?	?	?	?	?	?	?	?	?	?	?
2072	?	?	?	?	?	?	?	?	?	?	?	?
2073	?	?	?	?	?	?	?	?	?	?	?	?
2074	?	?	?	?	?	0	?	?	?	?	?	?
2075	?	?	?	?	?	?	?	?	?	?	?	?
2076	?	?	?	0	?	?	?	?	?	?	?	?
2077	?	?	?	?	?	?	?	?	?	?	?	?
2078	?	?	?	?	?	?	?	?	?	?	?	?
2079	?	?	?	?	?	?	?	?	?	?	?	?
2080	?	?	?	?	?	?	?	?	?	?	?	?
2081	?	?	?	?	?	?	?	?	?	?	?	?
2082	?	?	?	?	?	?	?	?	?	?	?	?
2083	?	?	?	?	?	?	?	?	?	?	?	?
2084	Rhacheosaurus_gracilis			?	0	0	0	2	1	?	1	3
2085	3	?	?	?	3	0	1	2	1	1	1	1
2086	0	1	0	0	0	0	0	0	?	1	1	1
2087	1	2	?	?	?	?	?	1	?	1	0	0
2088	0	?	0	2	0	0	0	1	1	0	0	2
2089	0	1	0	0	1	0	0	?	0	0	0	?
2090	0	0	1	1	1	0	0	1	0	0	?	?
2091	?	2	0	?	3	1	0	1	0	0	0	1
2092	0	2	1	0	1	0	1	1	0	1	0	?
2093	2	0	0	0	?	?	?	?	?	0	1	0
2094	0	?	0	0	2	0	?	1	0	0	0	0

2095	1	0	?	?	1	?	0	0	0	1	?	1
2096	0	?	?	0	?	0	0	?	?	1	?	1
2097	0	0	0	0	0	?	3	1	0	0	?	0
2098	1	1	0	1	1	1	1	?	0	?	?	1
2099	?	1	1	1	2	{2,3}	0	?	?	?	?	?
2100	?	?	?	?	?	?	?	?	?	?	0	0
2101	0	0	1	?	0	0	0	?	0	0	1	0
2102	0	0	0	?	0	0	0	0	1	1	1	2
2103	0	2	?	?	?	0	?	1	?	?	0	?
2104	0	1	1	?	0	1	1	1	?	?	?	?
2105	0	0	?	?	1	1	1	2	1	1	1	1
2106	1	1	?	?	1	0	1	?	?	?	?	?
2107	0	0	?	?	3	1	1	2	2	1	2	0
2108	?	?	0	?	?	?	?	?	?	2	1	?
2109	?											
2110	Metriorhynchidae_indet_Cuba				?	0	0	?	?	1	?	?
2111	?	?	?	?	?	?	?	?	?	?	?	?
2112	?	?	?	?	?	?	0	0	?	?	?	?
2113	?	?	?	?	?	?	?	?	?	?	?	0
2114	0	0	?	1	2	0	0	0	1	1	0	0
2115	?	?	?	?	?	?	?	0	?	?	0	?
2116	1	0	0	?	1	?	0	0	1	0	?	?
2117	?	?	?	0	?	3	1	0	1	0	0	0
2118	1	0	2	?	?	?	0	1	1	0	?	0
2119	?	2	0	?	?	?	?	?	?	?	?	1
2120	0	?	?	0	?	?	?	?	0	0	0	?
2121	?	1	0	?	?	?	0	0	0	0	1	?
2122	1	0	?	?	?	?	?	?	?	?	?	?
2123	?	?	?	?	?	?	?	?	1	?	?	?
2124	?	1	1	0	?	1	1	1	?	?	?	?
2125	1	?	?	?	?	?	?	?	?	?	?	?
2126	?	?	?	?	?	?	?	?	?	?	?	?
2127	?	?	?	?	?	0	?	?	?	?	?	?
2128	?	?	?	?	?	?	?	?	?	?	?	?
2129	?	?	?	?	?	?	?	?	?	?	?	?
2130	?	?	?	?	?	?	?	?	?	?	?	?
2131	?	?	?	?	?	?	?	?	?	?	?	?
2132	?	?	?	?	?	?	?	?	?	?	?	?
2133	?	?	?	?	?	?	?	?	?	?	?	?
2134	?	?	?	?	?	?	?	?	?	?	?	?
2135	?	?										

2136	Maledictosuchus_riclaensis			?	0	0	0	2	1	0	1	3
2137	3	?	0	0	1	0	1	2	1	1	1	1
2138	0	1	0	0	0	0	0	0	1	1	1	1
2139	1	2	?	?	?	?	?	1	?	1	0	0
2140	0	?	1	1	1	0	0	2	1	0	0	2
2141	0	1	0	0	1	0	0	2	0	0	0	1
2142	1	0	1	1	1	0	0	1	0	0	?	?
2143	1	2	0	0	3	1	0	1	0	0	0	1
2144	0	2	?	0	1	0	1	1	?	1	0	?
2145	2	?	0	0	1	1	0	0	1	0	1	0
2146	0	0	0	0	3	?	0	1	0	0	0	?
2147	1	0	?	?	1	?	0	0	0	1	?	?
2148	?	0	?	?	?	?	?	?	1	1	?	?
2149	?	0	0	0	0	?	?	?	0	0	0	0
2150	?	?	?	1	?	?	?	?	?	?	?	?
2151	?	?	?	?	2	4	0	1	0	0	2	?
2152	0	0	0	0	0	?	0	0	?	?	0	{0,1}
2153	0	0	1	?	0	?	0	0	0	0	1	0
2154	0	0	0	?	0	0	0	?	?	?	?	?
2155	?	?	?	?	?	?	?	?	?	?	?	?
2156	?	?	?	?	?	?	?	?	?	?	?	?
2157	?	?	?	?	?	?	?	?	?	?	?	?
2158	?	?	?	?	?	?	?	?	?	?	?	?
2159	?	?	?	?	?	?	?	?	?	?	?	?
2160	?	?	?	?	?	?	?	?	?	?	?	?
2161	?											
2162	Cricosaurus_macrospondylus			?	0	0	?	2	1	?	1	3
2163	3	?	0	0	3	0	1	0	0	1	1	?
2164	0	1	?	0	0	0	0	0	0	?	1	1
2165	1	2	?	?	?	?	?	1	?	?	?	0
2166	0	?	1	2	?	?	?	?	?	0	0	2
2167	?	1	0	0	1	0	1	3	?	0	0	2
2168	0	0	?	1	1	0	0	?	?	?	?	?
2169	?	?	?	?	3	1	0	1	0	0	0	0
2170	1	2	?	?	1	?	?	1	0	?	?	?
2171	?	0	0	0	?	?	?	?	?	?	?	0
2172	0	?	0	?	?	?	?	?	?	?	?	?
2173	?	?	?	?	?	?	?	?	?	1	?	?
2174	?	?	?	?	?	?	?	?	?	?	?	1
2175	0	0	0	0	0	?	?	1	?	0	?	0
2176	1	1	0	?	1	1	?	1	?	0	?	?
2177	?	1	?	?	2	2	0	1	0	?	?	?
2178	?	?	?	?	?	?	?	?	?	?	1	1

2179	0	0	1	?	0	?	0	0	0	0	1	1
2180	0	0	0	?	0	?	0	0	1	1	?	2
2181	0	?	?	?	?	0	?	?	?	?	?	?
2182	0	?	?	?	0	?	?	?	?	?	?	?
2183	?	?	?	?	?	?	?	?	?	?	?	?
2184	?	?	?	?	?	?	?	?	?	?	?	?
2185	?	?	?	?	?	?	?	?	?	?	?	0
2186	?	?	?	?	?	?	?	?	?	?	?	?
2187	?											
2188	Cricosaurus_saltillensis			?	?	0	0	2	?	?	1	3
2189	3	?	0	0	?	0	1	2	1	1	1	1
2190	0	1	0	0	?	0	0	0	?	?	?	?
2191	?	2	?	?	?	?	?	1	?	?	0	?
2192	0	?	1	3	0	0	0	?	1	0	?	2
2193	?	1	0	0	1	0	0	3	0	0	0	2
2194	0	0	?	1	?	?	0	?	?	0	?	?
2195	1	2	0	?	3	?	0	1	?	?	?	0
2196	1	2	?	?	?	?	1	?	?	?	0	?
2197	?	?	?	?	?	?	?	?	?	?	?	?
2198	?	?	?	?	?	?	1	0	0	?	?	?
2199	1	?	?	?	?	?	?	?	?	?	?	?
2200	?	?	?	?	?	0	?	?	?	?	?	?
2201	?	?	0	0	0	?	?	1	?	0	0	0
2202	?	?	?	?	1	1	1	1	?	?	?	?
2203	?	?	?	?	2	2	0	2	?	?	0	?
2204	0	0	0	0	0	?	?	?	?	?	?	?
2205	?	?	?	?	?	0	0	0	0	0	?	?
2206	?	?	?	?	?	?	?	?	?	?	?	?
2207	?	?	?	?	?	0	?	?	?	?	?	?
2208	?	?	?	?	?	?	?	?	?	?	?	?
2209	?	?	?	?	?	?	?	?	?	?	?	?
2210	?	?	?	?	?	?	?	?	?	?	?	?
2211	?	?	?	?	?	?	?	?	?	?	?	?
2212	?	?	?	?	?	?	?	?	?	?	?	?
2213	?											
2214	Metriorhynchus_palpebrosus			?	0	0	0	2	1	?	1	3
2215	3	?	0	0	?	0	1	2	1	1	1	1
2216	0	1	0	?	0	0	0	0	?	1	1	1
2217	1	2	?	?	?	?	?	1	?	?	0	0
2218	0	?	1	2	0	0	0	0	1	0	0	2
2219	1	1	0	0	1	0	0	?	0	0	0	1
2220	0	0	1	1	?	0	0	1	1	0	?	?

2221	?	2	0	?	3	1	0	1	0	0	0	0
2222	1	2	?	?	1	?	?	1	0	1	0	?
2223	?	0	0	0	?	?	?	?	?	0	1	0
2224	0	?	0	?	1	?	0	0	0	0	0	?
2225	?	0	?	?	?	?	?	?	0	1	?	1
2226	0	0	?	0	1	0	0	?	?	?	?	?
2227	?	0	0	0	0	?	2	1	?	0	?	0
2228	1	1	0	1	1	1	1	1	0	?	1	0
2229	0	1	1	1	2	3	0	1	0	0	?	?
2230	?	?	?	?	?	?	?	?	?	?	?	?
2231	?	?	?	?	0	?	?	?	?	0	1	1
2232	?	?	?	?	?	?	?	?	?	?	?	?
2233	?	?	?	?	?	?	?	?	?	?	?	?
2234	?	?	?	?	?	?	?	?	?	?	?	?
2235	?	?	?	?	?	?	?	?	?	?	?	?
2236	?	?	?	?	?	?	?	?	?	?	?	?
2237	?	?	?	?	?	?	?	?	?	?	?	?
2238	?	?	?	?	?	?	?	?	?	?	?	?
2239	?											
2240	Gracilineustes_acutus		?	0	0	0	?	?	?	1	3	2
2241	?	0	0	0	?	0	2	1	1	?	?	0
2242	?	?	?	?	?	?	?	?	?	?	1	?
2243	?	?	?	?	?	?	?	?	?	0	?	?
2244	?	1	?	0	0	0	0	?	0	?	2	0
2245	1	0	0	1	0	0	3	?	?	0	0	0
2246	0	1	?	?	0	0	?	1	?	?	?	?
2247	2	0	?	3	1	0	1	?	?	?	0	0
2248	2	?	?	1	?	?	1	?	?	?	?	?
2249	0	0	0	?	?	?	?	?	?	1	?	?
2250	?	?	?	2	?	?	?	?	0	?	?	?
2251	?	?	?	?	?	0	0	?	?	?	1	0
2252	?	?	?	?	?	?	?	?	?	?	?	?
2253	?	?	?	?	?	?	?	?	?	?	?	?
2254	?	?	?	?	?	?	?	?	?	?	?	?
2255	?	?	?	2	4	?	1	?	?	?	?	?
2256	?	?	?	?	?	?	?	?	?	?	?	?
2257	?	?	?	0	?	?	?	?	?	?	?	?
2258	?	?	?	?	?	?	?	?	?	?	?	?
2259	?	?	?	?	?	?	?	?	?	?	?	?
2260	?	?	?	?	?	?	?	?	?	?	?	?
2261	?	?	?	?	?	?	?	?	?	?	?	?
2262	?	?	?	?	?	?	?	?	?	?	?	?

2263	?	?	?	?	?	?	?	?	?	?	?	?
2264	?	?	?	?	?	?	?	?	?	?	?	?
2265	Gracilineustes_leedsi		0	0	0	0	0	1	?	1	3	2
2266	0	0	0	1	0	0	2	1	1	1	1	0
2267	1	0	0	0	0	0	0	?	1	1	1	1
2268	2	?	?	?	?	?	1	?	1	0	0	0
2269	?	1	1	0	0	0	0	1	0	0	2	0
2270	1	0	0	1	0	0	3	0	0	0	0	0
2271	0	1	0	1	0	0	1	1	0	?	?	1
2272	2	0	0	3	1	0	1	0	0	0	0	0
2273	2	1	0	1	0	1	1	0	1	0	?	1
2274	0	0	0	1	{0,1}	1	?	1	0	1	0	0
2275	?	0	0	?	0	0	0	0	0	?	?	1
2276	0	?	?	1	?	0	0	0	1	?	1	0
2277	0	?	0	1	0	0	?	?	?	2	1	0
2278	0	0	0	0	1	3	1	0	0	0	0	1
2279	1	0	1	1	0	1	1	0	0	1	0	0
2280	1	1	1	2	4	0	0	0	1	0	1	0
2281	0	0	0	0	1	0	0	?	?	0	1	0
2282	0	1	?	0	0	0	?	0	0	1	1	0
2283	0	0	?	0	0	3	0	1	?	0	2	0
2284	?	?	?	?	0	1	1	?	?	0	0	0
2285	0	1	1	?	1	1	1	2	2	0	1	0
2286	0	2	1	0	0	1	1	1	?	?	?	?
2287	?	?	?	?	?	?	0	0	?	2	?	0
2288	0	0	1	2	1	1	1	2	1	?	0	?
2289	?	0	?	?	?	?	?	?	2	1	?	?
2290	Metriorhynchus_superciliosus				1	0	0	0	3	1	0	1
2291	3	2	0	0	0	1	0	0	2	1	1	1
2292	1	0	1	0	0	0	0	0	0	?	1	1
2293	1	1	2	?	?	?	?	?	1	?	1	0
2294	0	0	?	1	1	0	0	0	0	1	0	0
2295	2	0	1	0	0	1	0	0	0	0	0	0
2296	0	0	0	1	0	1	0	0	1	0	1	1
2297	?	1	2	0	0	3	1	0	1	0	0	0
2298	0	0	2	1	0	1	0	1	1	0	1	0
2299	?	1	0	0	0	1	1	1	?	1	0	1
2300	0	0	?	0	0	1	0	0	0	0	0	0
2301	0	1	0	1	?	1	0	0	0	0	1	0
2302	1	0	0	?	0	1	0	0	0	1	1	2
2303	1	0	0	0	0	0	1	2	1	0	0	0
2304	0	1	1	0	1	1	0	1	1	0	0	1

	0	0	1	1	1	2	3	0	1	0	0	0
	0	0	0	0	0	0	1	0	0	0	?	0
	1	0	0	1	?	0	0	0	0	0	0	1
	1	1	0	0	?	0	0	3	0	1	1	0
	2	0	2	2	?	?	0	1	1	1	1	0
	0	0	0	1	1	0	1	1	1	2	2	0
	1	0	0	1	1	0	0	1	1	1	1	1
	1	1	1	1	0	1	0	1	0	0	1	2
	0	0	0	0	1	2	?	1	1	?	1	2
	0	?	?	0	?	?	?	?	?	?	2	1
	?	?										
Geosaurine_indet_Argentina				?	1	?	?	?	1	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	0	0	?	?	1	?	1
	0	2	?	?	?	?	?	?	?	?	0	0
	?	?	?	?	?	?	?	0	1	?	?	2
	0	1	0	?	?	?	0	0	?	?	?	0
	?	0	?	?	?	0	0	?	0	?	?	?
	?	?	?	?	3	?	0	1	?	?	?	?
	?	2	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	2	?	?	?	?
	1	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	1	?	?	?	?
	?	?	?	?	?	?	?	?	0	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	0	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	1	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?	?	?	?	?	?	?	?	?	?	?	?
	?											
Metriorhynchus_casamiquelai					1	1	0	0	0	1	?	1
	3	2	?	0	0	2	0	0	2	1	1	1
	?	0	1	0	?	0	0	0	0	?	?	1
	1	0	2	?	?	?	?	?	1	?	1	0
	0	0	?	1	2	0	0	0	0	1	0	1

2347	2	0	1	0	0	1	0	0	3	0	0	0
2348	0	0	0	1	0	1	0	0	1	0	0	?
2349	?	1	2	0	0	3	0	0	1	0	0	0
2350	0	0	2	?	?	1	1	1	1	0	1	0
2351	?	1	0	0	0	?	?	?	?	?	0	1
2352	0	0	?	0	0	3	0	?	2	0	0	?
2353	0	1	0	?	0	1	?	?	0	0	1	?
2354	1	0	?	0	0	1	0	0	?	1	1	?
2355	1	0	0	0	0	0	1	3	1	?	0	0
2356	0	1	1	0	?	0	1	0	?	0	?	0
2357	0	?	?	?	?	2	2	0	1	?	?	?
2358	?	?	?	?	?	?	?	?	?	0	?	?
2359	1	0	0	0	?	0	0	0	?	?	0	1
2360	0	0	?	?	?	?	?	?	?	?	?	?
2361	?	0	?	?	?	?	0	?	?	?	?	?
2362	?	?	?	?	?	?	?	?	?	?	?	?
2363	?	?	?	?	?	?	?	?	?	?	?	?
2364	?	?	?	?	?	?	?	?	?	?	?	?
2365	?	?	?	?	?	?	?	?	?	?	?	?
2366	0	?	?	?	?	?	?	?	?	?	?	?
2367	?	?										
2368	Metriorhynchus_westermanni?				?	?	0	?	?	?	?	?
2369	?	?	?	?	?	?	?	?	?	?	?	?
2370	?	?	?	?	?	?	?	0	?	?	?	?
2371	?	?	?	?	?	?	?	1	?	?	0	0
2372	?	?	1	2	?	?	?	?	1	?	1	2
2373	?	?	?	?	?	?	?	3	?	0	0	0
2374	0	?	1	0	?	?	?	?	?	?	?	?
2375	?	?	0	?	3	?	?	?	?	?	?	?
2376	?	2	?	?	?	?	?	?	?	?	?	?
2377	?	?	?	?	?	?	?	?	?	?	?	?
2378	?	?	?	?	?	0	1	2	?	0	?	0
2379	1	?	1	0	?	?	?	?	?	1	?	?
2380	?	?	0	?	?	?	?	?	?	?	2	?
2381	?	?	?	?	?	?	?	?	?	?	?	?
2382	?	?	?	?	?	?	?	?	?	?	?	?
2383	?	?	?	?	?	?	?	?	?	?	?	?
2384	?	?	?	?	?	?	?	?	?	?	?	?
2385	?	?	?	?	?	?	?	?	?	?	?	?
2386	?	?	?	?	?	?	?	?	?	?	?	?
2387	?	?	?	?	?	?	?	?	?	?	?	?
2388	?	?	?	?	?	?	?	?	?	?	?	?
2389	?	?	?	?	?	?	?	?	?	?	?	?

2390	?	?	?	?	?	?	?	?	?	?	?	?
2391	?	?	?	?	?	?	?	?	?	?	?	?
2392	?	?	?	?	?	?	?	?	?	?	?	?
2393	?											
2394	Neptunidraco_ammoniticus			?	1	?	?	?	1	?	?	?
2395	?	?	?	?	?	?	?	?	?	1	?	?
2396	?	?	?	0	?	?	?	?	?	?	?	1
2397	?	?	?	?	?	?	?	?	?	?	0	?
2398	?	?	?	2	0	0	0	?	?	?	?	2
2399	?	1	0	0	?	0	0	?	?	?	?	1
2400	1	?	?	?	1	0	?	1	?	?	?	?
2401	?	?	?	?	3	?	0	1	?	?	?	?
2402	?	2	?	?	?	?	?	?	?	?	?	?
2403	?	?	?	?	?	?	?	?	?	?	?	?
2404	?	?	?	?	?	?	?	?	?	?	?	?
2405	?	?	?	?	?	?	?	?	?	?	?	?
2406	?	?	?	?	?	?	?	?	?	?	?	?
2407	?	0	0	0	0	?	?	1	?	0	?	0
2408	?	?	?	1	?	?	0	?	?	?	?	?
2409	?	1	?	?	?	2	?	?	?	?	?	?
2410	?	?	?	?	?	?	?	?	?	?	0	1
2411	0	0	0	?	0	0	0	0	0	?	{0,1}	?
2412	?	?	?	?	?	?	?	?	?	?	?	?
2413	0	1	?	?	?	?	?	?	?	?	?	?
2414	?	?	?	?	?	?	?	?	?	?	?	?
2415	?	?	?	?	?	?	?	?	?	?	?	?
2416	?	?	?	?	?	?	?	?	?	?	?	?
2417	?	?	?	?	?	?	?	?	?	?	?	0
2418	?	?	?	?	?	?	?	?	?	?	?	?
2419	?											
2420	M_brachyrhynchus		{1,2}	1	0	0	3	1	0	1	3	2
2421	0	0	0	1	0	0	{0,1}	1	1	1	1	0
2422	1	0	0	0	0	0	0	?	1	1	1	0
2423	2	?	?	?	?	?	1	?	1	0	0	0
2424	?	1	1	0	0	0	0	1	0	0	2	1
2425	1	0	0	1	0	0	0	0	0	0	1	1
2426	0	1	0	1	0	0	1	0	0	?	?	1
2427	2	0	0	3	1	0	1	0	0	0	0	0
2428	2	?	0	1	1	1	1	0	1	0	?	1
2429	0	0	0	1	3	0	1	0	0	1	0	0
2430	?	0	0	3	0	0	2	0	0	0	0	1
2431	0	?	?	1	?	0	0	0	1	?	1	0

2432	0	?	0	1	0	0	?	?	1	2	1	0
2433	0	0	0	0	1	1	1	0	0	0	0	1
2434	1	0	1	1	0	0	1	0	0	1	0	1
2435	1	1	1	2	2	0	2	0	0	0	0	0
2436	0	0	0	0	1	0	0	1	?	0	{1,2}	0
2437	0	0	?	0	0	0	0	0	0	1	1	0
2438	1	1	1	1	0	3	0	0	1	0	2	0
2439	1	2	?	?	0	1	1	1	1	0	0	0
2440	0	1	1	0	1	1	1	?	?	?	?	?
2441	?	?	?	?	?	?	?	?	?	?	?	?
2442	?	1	0	1	0	1	0	0	1	2	0	0
2443	0	0	1	1	?	?	?	?	?	2	0	?
2444	?	0	?	?	?	?	?	?	2	1	?	?
2445	Tyrannoneustes_lythrodectikos				?	1	0	0	3	1	0	1
2446	3	2	?	?	?	?	1	?	1	1	1	?
2447	1	?	1	0	0	0	0	0	0	?	?	?
2448	?	?	?	?	?	?	?	?	?	?	?	0
2449	0	0	?	1	1	0	0	0	0	1	0	?
2450	2	0	1	1	0	1	0	0	0	0	0	0
2451	1	1	0	1	?	1	0	0	1	0	0	?
2452	?	1	2	0	?	3	1	?	1	?	?	?
2453	0	0	2	?	?	?	?	1	1	0	?	0
2454	?	?	?	0	0	1	{2,3}	0	1	0	0	1
2455	?	?	?	?	?	?	0	?	2	0	0	0
2456	?	1	0	?	?	?	?	?	?	?	?	?
2457	1	0	0	?	?	?	?	0	?	?	?	?
2458	1	1	0	0	0	0	1	1	1	0	0	0
2459	0	2	1	0	?	?	?	?	1	0	0	1
2460	0	?	?	?	?	2	2	1	3	0	0	0
2461	0	0	0	0	0	0	1	0	0	1	?	1
2462	?	?	?	?	?	?	0	0	0	0	0	1
2463	1	0	1	1	1	1	0	1	0	?	?	?
2464	?	0	1	?	?	?	0	1	1	?	?	?
2465	?	?	?	?	1	?	?	?	?	2	2	0
2466	?	?	?	?	1	0	0	1	1	?	?	?
2467	?	?	?	?	?	1	0	1	1	1	1	2
2468	0	0	0	0	1	?	?	?	?	?	?	?
2469	0	?	?	?	?	?	?	?	?	?	2	1
2470	?	?										
2471	Metriorhynchus_hastifer			?	1	0	0	?	1	1	1	?
2472	?	?	?	?	?	1	?	1	1	1	1	1
2473	0	1	0	0	0	0	0	0	?	?	?	1

2474	0	2	?	?	?	?	?	1	?	?	0	?
2475	?	?	1	1	0	0	0	0	1	?	?	2
2476	?	1	1	?	1	0	0	0	0	0	0	1
2477	1	0	1	?	1	0	0	1	?	0	?	?
2478	?	2	0	?	3	1	0	1	?	?	?	0
2479	0	2	?	?	?	?	1	1	?	?	0	?
2480	?	?	0	0	1	2	0	1	0	0	1	?
2481	?	?	?	0	?	?	?	?	?	0	?	?
2482	?	?	?	?	?	?	?	?	?	?	?	?
2483	?	?	?	?	?	?	?	?	?	?	?	?
2484	?	?	?	?	?	?	?	?	?	?	?	?
2485	?	?	?	?	?	?	?	?	?	?	?	?
2486	?	?	?	?	2	2	1	?	1	0	?	?
2487	?	?	?	?	?	?	?	?	?	?	?	?
2488	?	?	?	?	0	?	?	0	0	0	?	?
2489	?	?	?	?	?	?	?	?	?	?	?	?
2490	?	?	?	?	?	?	?	?	?	?	?	?
2491	?	?	?	?	?	?	?	?	?	?	?	?
2492	?	?	?	?	?	?	?	?	?	?	?	?
2493	?	?	?	?	?	?	?	?	?	?	?	?
2494	?	?	?	?	?	?	?	?	?	?	?	?
2495	?	?	?	?	?	?	?	?	?	?	?	?
2496	?											
2497	Mr_Passmores_Specimen			?	1	0	0	3	1	1	1	3
2498	2	0	0	0	1	1	0	1	1	1	?	1
2499	?	1	0	0	0	0	0	?	?	?	?	?
2500	?	?	?	?	?	?	?	?	?	?	?	?
2501	?	?	?	?	?	?	?	?	?	?	?	2
2502	?	1	1	?	?	?	?	0	0	0	0	?
2503	?	?	?	?	?	?	?	?	?	?	?	?
2504	1	2	0	?	?	?	?	?	?	?	?	0
2505	0	?	?	?	?	?	?	?	?	?	?	?
2506	?	?	0	0	?	?	?	?	?	?	?	?
2507	?	?	?	?	?	?	0	?	?	?	?	?
2508	?	?	?	?	?	?	?	?	?	0	?	?
2509	?	?	?	?	?	1	0	?	?	?	?	?
2510	1	?	0	0	0	0	?	1	0	0	0	0
2511	2	?	?	?	?	?	?	1	0	0	?	?
2512	?	1	?	?	?	2	1	?	1	0	?	?
2513	?	?	?	?	?	?	?	?	?	?	1	1
2514	0	0	?	?	0	?	0	0	0	0	1	1
2515	0	1	1	1	1	0	?	0	?	?	?	?
2516	?	?	?	?	?	?	?	?	?	?	?	?

2517	0	?	?	?	?	?	?	?	?	?	?	?
2518	?	?	?	?	?	?	?	?	?	?	?	?
2519	?	?	?	?	?	?	?	?	?	?	?	?
2520	?	?	?	?	?	?	?	?	?	?	?	?
2521	?	?	?	?	?	?	?	?	?	?	?	?
2522	?											
2523	MANCH_J6459		?	1	0	?	2	?	?	?	?	?
2524	?	?	?	?	?	?	?	1	1	1	1	0
2525	1	?	0	?	0	0	0	?	?	?	?	?
2526	2	?	?	?	?	?	1	?	?	?	?	?
2527	?	?	?	?	?	?	?	?	?	?	?	?
2528	?	?	?	1	0	0	2	0	0	0	?	?
2529	?	?	?	?	?	?	?	?	?	?	?	?
2530	?	?	?	?	?	?	?	?	?	?	0	0
2531	?	?	?	?	?	?	?	?	?	?	?	?
2532	?	?	?	?	?	?	?	?	?	?	?	?
2533	?	?	?	?	?	?	?	?	?	?	?	?
2534	?	?	?	?	?	?	?	?	?	?	?	?
2535	?	?	?	?	?	?	?	?	?	?	?	?
2536	?	?	?	?	?	?	?	?	?	?	?	?
2537	?	?	?	?	?	?	?	?	?	?	?	?
2538	?	?	?	?	1	?	?	?	?	?	?	?
2539	?	?	?	?	?	?	?	?	?	?	?	?
2540	?	?	?	?	?	?	?	?	?	?	?	?
2541	?	?	?	?	?	?	?	?	?	?	?	?
2542	?	?	?	?	?	?	?	?	?	?	?	?
2543	?	?	?	?	?	?	?	?	?	?	?	?
2544	?	?	?	?	?	?	?	?	?	?	?	?
2545	?	?	?	?	?	?	?	?	?	?	?	?
2546	?	?	?	?	?	?	?	?	?	?	?	?
2547	?	?	?	?	?	?	?	?	?	?	?	?
2548	Torvoneustes_coryphaeus			?	?	?	0	2	1	?	?	?
2549	?	?	?	?	?	?	?	?	?	1	1	1
2550	?	1	?	?	0	?	?	0	1	1	1	1
2551	0	2	?	?	?	?	?	1	?	1	0	0
2552	0	?	1	2	0	0	0	1	1	0	0	2
2553	1	1	1	0	1	0	0	2	0	0	0	1
2554	1	0	1	0	1	0	0	1	1	0	?	?
2555	1	2	0	0	3	1	0	1	0	0	0	0
2556	0	2	?	?	1	1	1	1	0	1	0	0
2557	1	0	?	?	?	?	?	?	?	?	?	?
2558	?	?	?	?	?	0	1	2	0	0	0	0

1	0	1	0	1	?	?	?	?	?	0	?
?	0	?	0	?	?	0	?	1	1	?	1
1	?	?	?	?	?	?	1	?	?	?	?
2	1	?	?	?	?	?	1	0	?	?	?
1	1	1	1	?	2	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	1
0	0	?	?	1	?	0	0	0	0	1	1
?	?	?	?	?	?	3	1	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?											
Torvoneustes_carpenteri			?	1	0	0	2	1	1	?	3
2	0	0	0	1	1	0	1	1	1	1	1
0	1	0	0	0	0	0	0	?	?	1	?
?	?	?	?	?	?	?	1	?	?	0	?
0	?	1	2	0	0	0	0	?	0	?	2
?	1	1	0	1	0	0	3	0	0	0	1
1	0	1	0	1	?	0	1	?	0	?	?
?	?	0	?	3	1	0	1	?	?	?	0
0	2	?	0	?	?	1	1	0	?	0	?
?	0	0	0	?	3	?	?	0	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	0	?	?	?	?	?	?	0	?	?	?
?	?	?	?	?	0	?	?	?	?	?	?
?	0	0	0	0	?	?	?	0	0	0	0
?	?	0	?	?	?	?	?	?	?	?	0
?	?	1	1	2	1	1	?	0	0	0	?
0	?	?	?	?	?	?	?	?	?	1	1
0	0	0	?	1	?	0	0	0	0	1	1
1	1	2	1	1	0	3	1	?	?	?	2
0	1	?	?	?	0	1	1	?	?	?	1
0	?	?	?	?	1	1	1	?	?	?	?
?	?	?	0	0	0	1	1	1	?	?	?
?	?	?	?	1	0	?	?	?	1	2	0
0	0	0	?	?	?	?	?	?	?	?	0
?	?	?	?	?	?	?	?	?	?	?	?
?											

2600	Ieldraan_melkshamensis			?	?	?	?	1	?	?	?	?
2601	?	?	?	?	?	?	?	?	?	?	?	?
2602	0	1	?	?	?	0	?	?	?	?	?	?
2603	?	?	?	?	?	?	?	?	?	?	0	?
2604	?	?	?	{1,2}	?	0	0	?	?	?	0	2
2605	?	1	1	0	?	?	0	0	0	0	?	1
2606	?	?	?	?	?	?	?	?	?	?	?	?
2607	?	?	?	?	?	?	?	?	?	?	?	0
2608	?	?	?	?	?	?	?	?	?	?	?	?
2609	?	?	?	?	?	?	?	?	?	?	?	?
2610	?	?	?	?	?	?	?	?	?	?	?	1
2611	?	?	?	?	?	?	?	?	?	1	?	?
2612	?	?	?	?	?	?	?	?	?	?	?	1
2613	1	0	?	?	?	?	?	1	?	?	?	?
2614	2	?	0	?	?	?	?	1	?	?	?	?
2615	?	?	?	?	?	?	?	?	?	?	?	0
2616	?	?	?	?	?	?	?	?	?	?	?	?
2617	?	?	?	?	?	?	1	1	0	0	1	1
2618	1	1	1	1	1	1	0	0	?	?	?	?
2619	?	?	?	?	?	?	?	?	?	?	?	?
2620	?	?	?	?	?	?	?	?	?	?	?	?
2621	?	?	?	?	?	?	?	?	?	?	?	?
2622	?	?	?	?	?	?	?	?	?	?	?	?
2623	?	?	?	?	?	?	?	?	?	?	?	?
2624	?	?	?	?	?	?	?	?	?	?	?	?
2625	?											
2626	Geosaurus_giganteus		?	?	?	?	1	1	?	?	3	2
2627	?	?	?	2	0	0	1	1	1	1	1	0
2628	1	0	0	0	0	0	0	?	1	1	1	0
2629	2	?	?	?	?	?	1	?	1	0	?	?
2630	?	1	2	0	0	0	0	?	0	0	2	?
2631	1	1	0	1	0	0	3	?	0	0	1	1
2632	0	?	0	?	0	0	1	0	?	?	?	?
2633	?	?	?	3	1	0	1	0	0	0	0	1
2634	2	1	?	1	?	1	1	?	?	0	?	1
2635	0	0	0	?	?	?	?	?	?	?	?	?
2636	?	?	?	?	?	?	?	?	0	?	?	?
2637	0	?	?	?	?	?	?	0	?	?	?	?
2638	?	?	?	?	0	?	?	?	?	?	1	1
2639	0	0	0	0	1	1	1	0	0	0	0	2
2640	1	0	1	1	0	0	1	?	?	?	?	?
2641	?	1	1	2	1	0	3	?	?	0	?	0
2642	?	?	?	?	?	?	?	2	?	1	2	0

2643	0	0	1	0	{0,1}	1	1	0	0	1	1	0
2644	2	2	1	1	1	0	0	?	?	?	?	0
2645	?	?	?	?	0	?	1	?	?	?	?	?
2646	?	?	?	?	?	?	?	?	?	?	?	?
2647	?	?	?	?	?	?	?	?	?	?	?	?
2648	?	?	?	?	?	?	0	0	?	2	?	?
2649	?	?	?	?	?	?	?	?	?	?	?	?
2650	?	?	?	?	?	?	?	?	?	?	?	?
2651	Geosaurus_grandis		?	1	0	0	1	?	?	1	3	2
2652	0	0	0	2	0	0	1	1	1	1	1	0
2653	1	0	?	?	0	0	0	?	?	1	1	?
2654	?	?	?	?	?	?	1	?	?	0	?	?
2655	?	1	2	0	0	0	0	?	0	0	2	?
2656	1	1	0	1	0	0	3	0	0	0	1	1
2657	0	?	0	?	0	0	1	0	?	?	?	1
2658	2	0	?	3	?	0	1	?	?	?	0	1
2659	2	?	?	?	?	1	1	?	?	0	?	?
2660	0	0	0	?	?	?	?	?	?	?	?	?
2661	?	?	?	?	?	?	?	?	0	?	?	?
2662	0	?	?	?	?	?	?	0	?	?	?	?
2663	?	?	?	?	0	0	?	?	?	?	1	1
2664	0	0	0	0	?	?	?	?	0	0	0	?
2665	?	?	?	1	0	?	1	?	?	?	?	?
2666	?	1	1	2	?	0	?	?	?	0	?	0
2667	?	?	?	?	?	?	?	?	?	1	2	0
2668	0	?	?	0	{0,1}	1	1	0	0	1	1	0
2669	2	2	1	1	1	0	0	?	?	?	?	?
2670	?	?	?	?	?	?	?	?	?	?	?	?
2671	?	?	?	?	?	?	?	?	?	?	?	?
2672	?	?	?	?	?	?	?	?	?	?	?	?
2673	?	?	?	?	?	?	?	?	?	?	?	?
2674	?	?	?	?	?	?	?	?	?	?	?	?
2675	?	?	?	?	?	?	?	?	?	?	?	?
2676	Plesiosuchus_manselii			?	1	0	0	2	1	0	1	3
2677	2	0	0	0	2	0	0	2	1	1	1	1
2678	?	1	0	0	0	0	0	0	?	?	1	?
2679	?	?	?	?	?	?	?	1	?	?	0	0
2680	0	?	1	?	0	0	0	?	2	0	?	?
2681	?	1	1	?	?	?	0	1	0	0	0	?
2682	1	0	?	?	?	0	0	1	0	0	?	?
2683	1	2	0	0	?	?	?	?	?	?	?	0
2684	0	?	?	?	?	?	1	?	?	?	?	?

2685	1	0	0	0	1	5	0	0	0	?	1	?
2686	?	?	?	?	?	?	1	2	0	0	0	0
2687	1	0	?	?	?	0	?	?	0	1	?	1
2688	0	0	?	0	?	1	0	?	?	?	2	1
2689	1	0	0	0	0	1	1	1	0	0	0	0
2690	2	1	0	1	1	0	0	1	0	0	1	0
2691	1	1	1	1	2	1	0	3	0	1	0	1
2692	0	0	0	0	0	0	0	0	2	?	2	1
2693	0	0	0	?	0	0	0	0	0	0	1	1
2694	0	2	2	0	1	?	2	0	?	?	?	?
2695	?	?	?	?	?	?	?	?	?	?	?	1
2696	?	?	?	?	?	?	?	?	?	?	?	?
2697	?	?	?	0	?	?	?	?	?	?	?	?
2698	?	?	?	?	?	?	?	?	?	?	2	?
2699	?	?	?	?	?	?	?	?	?	?	?	?
2700	?	?	?	?	?	?	?	?	?	?	?	?
2701	?											
2702	Dakosaurus_andiniensis			?	2	1	0	0	1	?	1	3
2703	3	?	0	0	2	0	0	1	1	1	1	?
2704	0	1	0	0	0	0	0	1	?	1	1	1
2705	0	2	?	?	?	?	?	1	?	1	0	0
2706	0	?	1	3	0	0	0	0	2	0	0	2
2707	1	1	2	1	1	0	0	3	0	0	0	2
2708	1	0	?	0	1	0	0	1	0	0	?	?
2709	1	2	0	0	3	1	0	1	0	0	0	0
2710	0	2	1	?	1	1	1	1	0	1	0	0
2711	1	0	0	0	?	?	?	?	?	?	1	?
2712	?	?	0	?	?	?	0	2	0	0	?	?
2713	1	0	1	0	?	?	?	?	0	0	?	1
2714	0	0	0	?	?	0	0	?	1	1	?	1
2715	1	0	0	0	0	1	0	1	1	0	1	0
2716	2	1	1	?	1	0	?	1	0	?	?	0
2717	?	?	1	1	2	0	0	3	?	1	?	?
2718	?	?	?	?	?	?	?	?	?	?	2	1
2719	0	0	0	1	0	0	0	0	0	?	1	1
2720	0	2	2	1	2	0	0	0	?	?	?	?
2721	?	?	?	?	?	?	?	?	?	?	?	?
2722	?	?	?	?	?	?	?	?	?	?	?	?
2723	?	?	?	?	?	?	?	?	?	?	?	?
2724	?	?	?	?	?	?	?	?	?	?	?	?
2725	?	?	?	?	?	?	?	?	?	?	?	0
2726	?	?	?	?	?	?	?	?	?	?	?	?
2727	?											

2728	Dakosaurus_maximus		?	1	1	0	3	1	?	1	3	3
2729	0	0	0	2	0	0	1	1	1	1	1	?
2730	1	0	0	0	0	0	1	?	?	1	1	0
2731	?	?	?	?	?	?	?	?	?	0	0	0
2732	?	1	3	0	0	0	0	2	0	?	2	1
2733	1	2	1	1	?	0	1	?	0	0	1	1
2734	0	1	?	1	0	0	1	0	0	?	?	?
2735	2	0	?	3	?	0	1	?	?	?	0	0
2736	2	?	?	?	?	1	?	?	?	?	?	1
2737	0	0	0	?	?	?	?	?	?	1	?	?
2738	?	?	?	?	?	?	2	0	0	?	?	1
2739	?	?	?	?	?	?	?	?	?	?	1	0
2740	?	?	?	?	0	?	?	?	?	?	1	1
2741	0	0	0	0	?	1	1	1	0	1	0	2
2742	1	1	1	1	0	0	1	0	0	?	0	1
2743	1	1	1	2	1	0	3	0	1	2	1	1
2744	0	0	0	0	0	0	0	3	?	2	1	0
2745	0	0	?	0	0	0	0	0	1	1	1	0
2746	2	2	1	2	?	0	0	?	?	?	2	0
2747	1	?	?	?	0	1	1	?	?	?	1	?
2748	?	?	?	?	1	1	?	2	2	?	?	?
2749	?	1	?	0	0	1	1	1	?	?	?	?
2750	1	?	?	?	?	?	?	?	1	2	?	0
2751	0	?	?	?	?	?	?	?	?	?	0	?
2752	?	?	?	?	?	?	?	?	2	1	?	?
2753	Suchodus_durobrivensis			?	1	0	0	2	1	?	?	3
2754	2	?	?	?	?	0	0	1	1	1	?	1
2755	0	1	0	0	0	0	0	0	?	?	?	?
2756	?	2	?	?	?	?	?	?	?	?	0	0
2757	0	?	1	1	0	0	0	?	2	0	?	?
2758	?	1	?	?	?	?	?	0	0	0	0	1
2759	?	?	?	?	?	?	?	?	0	?	?	?
2760	1	2	0	?	3	?	?	?	?	?	?	0
2761	0	2	?	?	?	?	?	?	?	?	?	?
2762	?	?	0	0	1	4	0	0	0	0	1	?
2763	?	?	?	?	?	0	0	2	0	?	?	?
2764	1	?	?	?	?	0	?	0	?	0	?	?
2765	?	?	?	0	?	1	0	?	?	?	?	1
2766	1	0	0	0	0	?	1	1	0	0	0	0
2767	2	1	0	1	?	?	?	1	0	0	?	?
2768	?	1	1	1	?	1	0	3	0	1	0	1
2769	0	0	0	0	0	0	0	0	1	?	2	1
2770	0	0	?	?	0	?	0	0	0	0	1	1

0	1	1	0	1	?	1	0	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?											

Mr_Leeds_Dakosaur		?	1	1	0	3	1	?	1	3	?
0	0	0	2	0	0	1	1	1	1	1	0
1	0	0	0	0	0	?	?	1	?	1	?
2	?	?	?	?	?	1	?	?	0	0	0
?	1	1	0	0	0	0	2	0	0	2	1
1	1	1	1	0	0	0	0	0	0	1	1
0	1	0	1	0	0	1	0	0	?	?	1
2	0	?	3	1	?	1	?	?	?	0	0
0	?	?	?	?	1	?	?	?	0	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	2	0	0	0	?	1
?	?	?	?	?	?	?	?	1	?	?	?
?	?	0	?	0	0	?	?	?	?	1	1
0	0	0	0	?	?	1	0	0	?	0	2
1	0	?	1	?	?	1	?	?	?	?	?
1	1	1	2	1	0	3	0	0	?	?	?
?	?	?	?	?	?	?	?	?	2	1	0
0	0	?	0	0	0	0	0	1	1	1	0
1	1	1	1	0	2	0	?	?	?	?	?
?	?	?	?	?	?	?	?	?	0	1	0
?	?	?	?	1	1	?	?	?	?	?	?
?	?	0	0	0	1	1	?	1	1	1	1
1	?	?	1	0	1	0	0	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?
?	?	?	?	?	?	?	?	?	?	?	?

Synapomorpy list for the main nodes:

Thalattosuchia:

Char. 2: 2 --> 0

Char. 8: 0 --> 1

Char. 10: 0 --> 1

Char. 17: 0 --> 2

Char. 18: 0 --> 1

Char. 19: 0 --> 1

Char. 77: 0 --> 1

Char. 79: 1 --> 0

Char. 95: 1 --> 2

Char. 106: 2 --> 0

Char. 122: 0 --> 1

Char. 139: 0 --> 1

Char. 150: 0 --> 1

Char. 159: 0 --> {2,3}

Char. 171: 0 --> 1

Char. 172: 0 --> 1

Char. 173: 0 --> 1

Char. 195: 0 --> 1

Char. 217: 0 --> 1

Char. 243: 0 --> 1

Char. 246: 0 --> 1

Char. 250: 1 --> 0

Char. 251: 1 --> 0

Char. 274: 1 --> 0

Char. 276: 1 --> 0

Metriorhynchoidea

Char. 96: 0 --> 1

Char. 99: 1 --> 0
Char. 130: 0 --> 1
Char. 241: 0 --> 1
Char. 296: 0 --> 1

Metriorhynchidae

Char. 72: 0 --> 1
Char. 86: 2 --> 3
Char. 258: 0 --> 1

Metriorhynchinae

Char. 34: 0 --> 1
Char. 112: 0 --> 1
Char. 114: 0 --> 1
Char. 222: 0 --> 1

Geosaurinae

Char. 2: 0 --> 1
Char. 99: 0 --> 1
Char. 122: 1 --> 3
Char. 125: 0 --> 2
Char. 172: 1 --> 0

Geosaurini

Char. 60: 0 --> 1
Char. 154: 0 --> 1
Char. 166: 1 --> 2
Char. 200: 0 --> 1
Char. 237: 0 --> 1

Geosaurina

Char. 5: 3 --> 1

Char. 208: 0 --> 1

Char. 209: 0 --> 1

Char. 219: 0 --> 1